Consulting Engineer

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June 1957

New CEC President

EDWARD J. WOLFF, consulting engineer, of Chicago, is the newly elected president of the Consulting Engineers Council, a federation of 17 state and regional associations of consulting engineers. He and his executive committee will be primarily

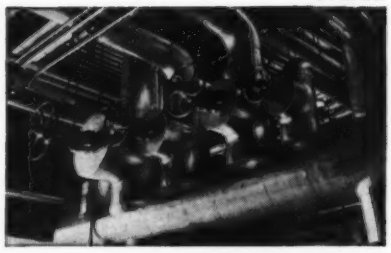
Continued on page 8

The Consulting Engineer's Professional Magazine

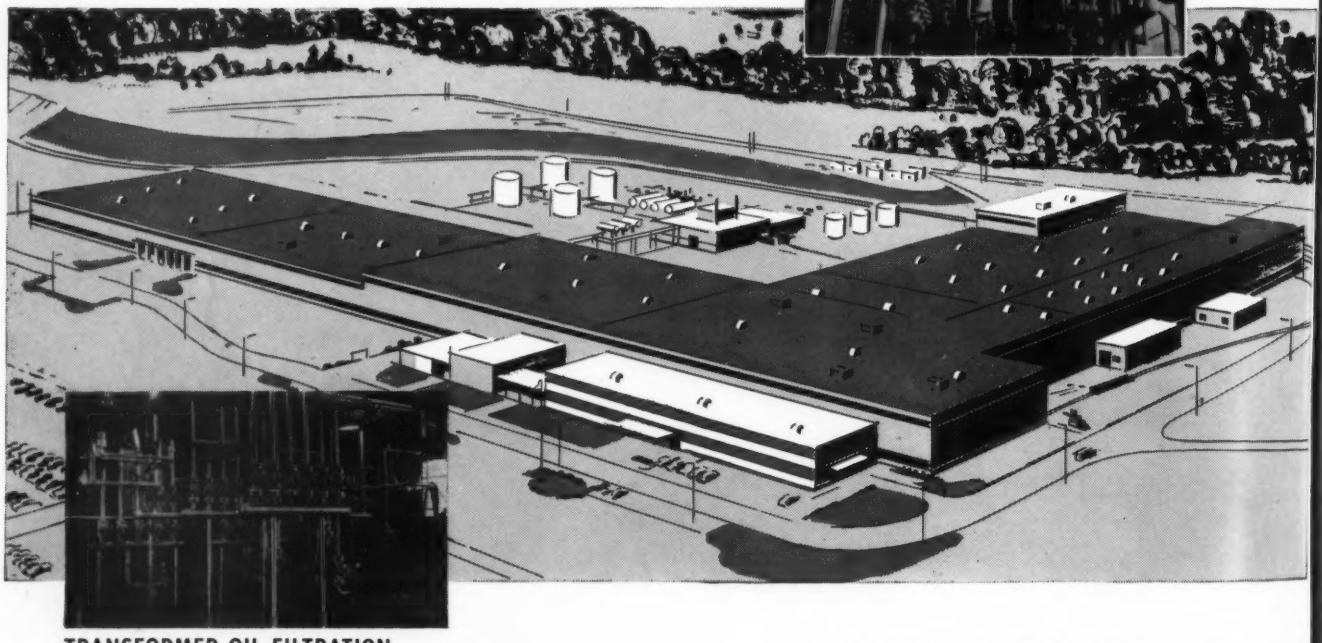
You see OIC Valves everywhere

at the new General Electric Distribution Transformer Plant, Hickory, North Carolina.

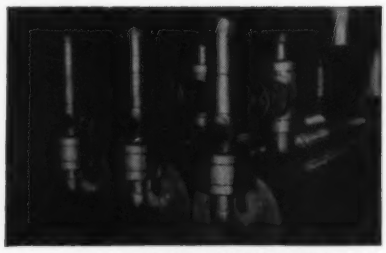
STEAM



OIL PROCESSING



TRANSFORMER OIL FILTRATION



PRE-HEATING FUEL OIL

The name *General Electric* is a promise of quality to users of complex electrical equipment. To help make good that promise, GE insists on this same high quality from its own suppliers. That's why you see OIC Valves of many types in nearly all valve installations in this new General Electric plant.

ARCHITECT-ENGINEER: *Robert & Company Associates, Atlanta, Ga.*

MECHANICAL CONTRACTOR: *Hicks & Ingle Co., Charlotte, N. C.*

MATERIALS FURNISHED BY: *Atlas Supply Company, Charlotte, N. C.*

OIC VALVES

FORGED & CAST STEEL, BRONZE & IRON, LUBRICATED PLUG VALVES

JUN

Consulting Engineer®

The Consulting Engineer's Professional Magazine

June, 1957 • VOLUME IX • NUMBER VI

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A question for every electric utility

JUST HOW FLEXIBLE CAN POWER SUPPLY GET?

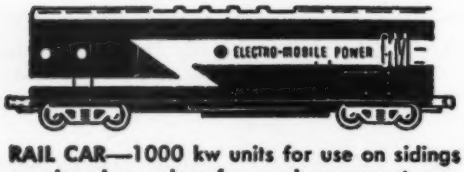
Giant strides to improve flexibility of supply to customers have been taken in recent decades by the electric utility industry. Today power availability must anticipate load growth more than ever before. Inter-connected supply permits transferal of power from one area to another as varying geographical load demands or emergency situations arise.

Even greater flexibility, however, can be attained—by means of Electro-Mobile Power. Truck-trailer or rail units permit shifting increments of power from place to place as demands change. Units can be used singly or in multiple—added like building blocks to match requirements exactly. And provision for impulse starting and stopping allows unattended operation from any location in the system.

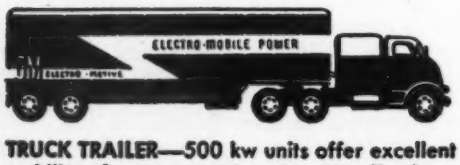
Moreover, the placement of Electro-Mobile Power close to the load not only relieves the central station of a block of power, but also reduces the line loss between the central station and the load for that block of power. This is a major factor at time of peak.

Just how flexible can service get? Far more flexible than you might imagine with present equipment if Electro-Mobile Power is employed to answer additional requirements. A joint analysis of your system can reveal the savings and increased flexibility possible with these units. Contact your Electro-Motive representative for full information.

Electro-Mobile Power adds to system flexibility in many ways

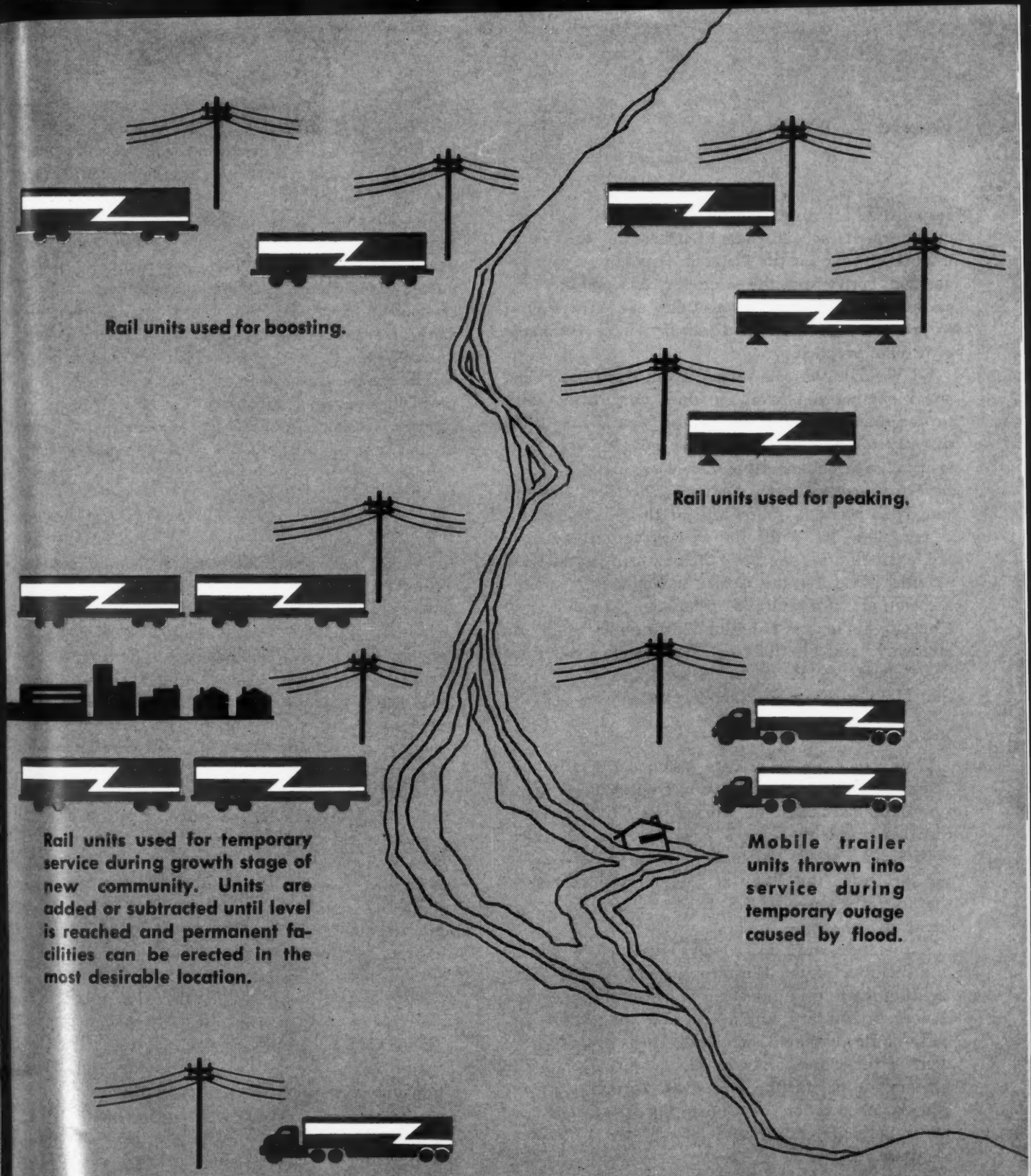


RAIL CAR—1000 kw units for use on sidings or placed on piers for semi-permanent use.



TRUCK TRAILER—500 kw units offer excellent mobility for many temporary applications.

Representative electric utility companies across the country are now providing better service to customers through the use of Electro-Mobile Power. This diagram is a composite of the different jobs these units, both truck-trailer and rail, are performing. Detailed information on these applications—operating costs, KWH produced, reason for use, location, etc.—are available through your Electro-Motive representative.



Rail units used for boosting.

Rail units used for peaking.

Rail units used for temporary service during growth stage of new community. Units are added or subtracted until level is reached and permanent facilities can be erected in the most desirable location.

Mobile trailer units thrown into service during temporary outage caused by flood.

Mobile trailer units being used during line relocation resulting from new highway construction.

ELECTRO-MOTIVE DIVISION
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Sales Offices in Chicago, New York, St. Louis, San Francisco

Edward J. Wolff . . .

Continued from front cover

responsible for directing the activities of the Council during its second year of operation. This is an important year for the Council. It is now a well organized body, and the Member Associations and prospective Member Associations are expecting it to produce a program of direct benefit to engineers in private practice.

Ed Wolff is the sole owner of an eight-man electrical engineering firm. He does very little work for architects, almost all his projects being done directly for private industry or government. Currently, his firm is handling the electrical design work for Great Lakes Carbon's extension to their Morganton, N.C. plant, a follow-up on the original plant design done by Wolff four years ago. He is also doing the lighting for Bong Airport runway at Kansasville, Wisc. for the Corps of Engineers; and, in association with John F. Meissner Engineers, of Chicago, his firm is handling lighting for the Peoria Highway; and all the electrical system design for the Caland Ore Plant, in Canada, and the Morton Salt Mine, in Fairport Harbor, Ohio.

Broad Experience

Wolff has been in private practice for only nine years. Following his graduation from Armour Institute (Illinois Tech), he worked for 13 years for a contractor and then for 6 years with an architect, with 3 years taken out in the middle of the last job for service in the Navy as Engineering Officer on the aircraft carrier, *U.S.S. Essex*. In 1949 he set up his own firm.

Association work has always attracted Wolff. He is a member of the Western Society of Engineers, the Illuminating Engineering Society, the Society of American Military Engineers, and the Illinois Society of Professional Engineers. He is a past president of the Chicago Association of Consulting Engineers, he is on the Board of Directors of the Illinois Association of Consulting Engineers, and he is immediate past secretary of the Consulting Engineers Council.

Following his election as president of the Council at their First Annual Meeting, in Minneapolis, on May 4, Edward Wolff gave these answers to questions put to him by CONSULTING ENGINEER in an exclusive interview in Minneapolis.

Question — Mr. Wolff, what do you feel is the most important job ahead for the Consulting Engineers Council?

Answer — There is no one most important job. There are several important jobs to be done, but they are all interrelated. All members of the Board of Directors have known since the day the Council started that it would have to increase its membership if it hoped to carry through the planned program. On the other hand, it was also recognized that many potential Member Associations were sitting and waiting to see what the Council would accomplish before deciding to join. This appeared to present something of a dilemma, but it never really developed as a serious problem. The membership committee went about its work, and during the year succeeded in getting into the Council seven new state or regional associations. The Executive Committee, with the help of the various standing and special committees, went to work on organizational problems and on the formulating of a program for Council action. As a result, we ended our first annual meeting with a 70 percent increase in membership and with a full schedule of planned or partially completed projects.

Office and Staff

We are now in a position to do some important work for consulting engineers. A reading of the report on our Annual Meetings will show what we are doing, but we cannot really move as fast as we should until we have taken one more important organizational step. We need an office and an Executive Secretary. That, as I see it, must come soon.

Fortunately, we are much better off financially than we thought we would be. In February we set up a tentative 1957-58 budget based on an anticipated income of about $18,000. Now we have four more new Member Associations than we had in February, and it looks as though we will have an income closer to $24,000. That is not much money, I know, but we had assigned a part of the lower budget to a part-time Executive Secretary, and with this increased income, we should be able to get a good man, full time. It is my hope that we can find the right man and put him to work quickly.

There is enough important Council work to be done day by day to keep the best man busy even with help from the Board Members and the committees. Last year all of us devoted a lot of our time and money to Council activities, and I feel sure no member of the Board regrets one minute or one dollar spent, but all of us have our own offices to operate, and we can no longer expect the growing volume of routine work to be handled on a volunteer basis. For one thing, that is too expensive a way to do association work.

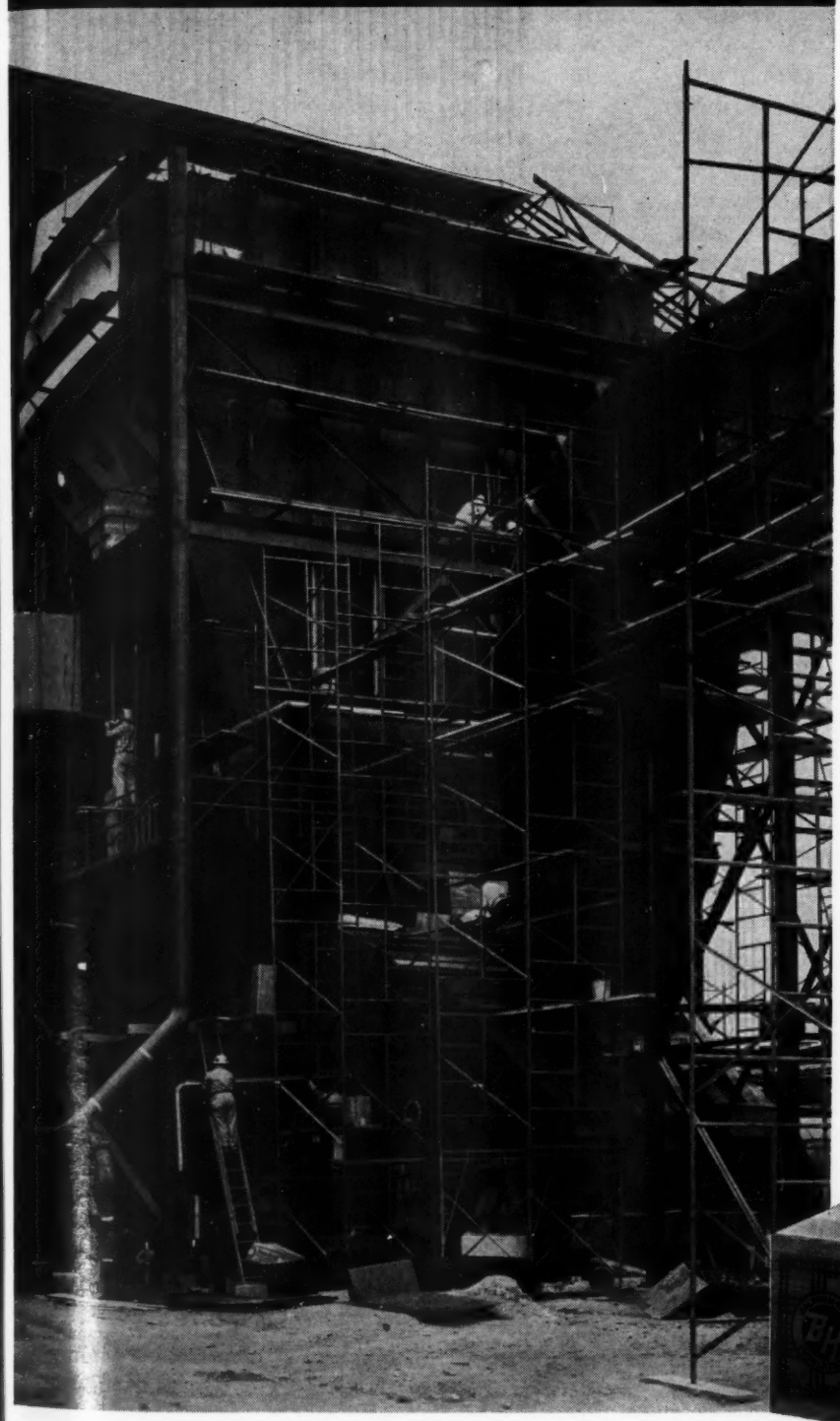
So to be specific in my answer, I think our first job is to employ a full-time Executive Secretary and set him to work in coordinating and implementing the many projects we have under way.

What are the Projects?

Q — When you speak of the "jobs under way," which is most vital?

A — I think the first groups of projects to get under way are those having to do with publicity.

500,000 lb. per hr. BOILERS at New DELAWARE CITY STATION



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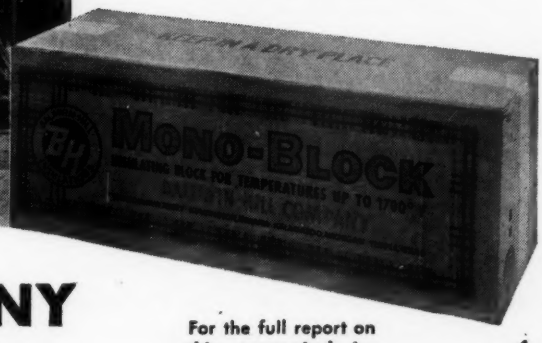
See our catalog in Sweet's Plant Engineering File.



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J-454

For example, we have started the gathering of data for a roster of members of the Member Associations. That, I think, is a most important project. We now have about 750 men, about 600 firms, represented on the Council. We want to publish a roster that not only gives the names and addresses of these men and their firms, but tells a little about their background and experience. We think that directory would be of value both inside and outside the membership. We frequently get requests from industrial firms who want the name of a consulting engineer experienced in the field of some project they are planning. We do not think that the Council should ever recommend a particular man or firm for a job, but we would like to be able to send the prospective client a copy of the directory from which he could then select the firm he felt best suited his particular needs

Information Brochure

We have another publication project I think is of equal importance. Plans have been made for publication of a brochure designed to explain to government, industry, architects, or other potential clients the function of the consulting engineer — a booklet telling the way he should be engaged, his relationship to the client, and other factual information that would clearly indicate the benefits offered to a client by the engineer in private practice. The publication of a brochure of that type could mean considerably increased business for independent consulting engineers.

We also need a good "Newsletter" that would be sent regularly to all members to keep them informed of the activities in other state or regional associations.

Those, I think, are the most vital jobs at the moment. All of the basic planning was made last year. This year we need to carry those plans through.

Q — Is the Council trying to establish uniform recommended fee schedules for engineers throughout the country?

A — The answer to that is, "No." Certainly not at the moment. We do have a committee on Fees and Contracts, and it is not inconceivable that at some future date conditions might be such that a recommended minimum or median fee schedule could be set up. But I am afraid that is a long time off.

It is my personal feeling, and here I am not speaking for the Council, that there is no such thing as a sensible fee schedule today. Recommended fee schedules mean nothing until standards are established. To establish a price on a given commodity or service, we must first establish some level of quality. There is no point in trying to establish a selling price for automobiles, for example, if you do not know whether you are selling Chevrolets or Cadillacs to the customers.

Almost every consulting engineer is selling a different service. If we adopt a recommended minimum fee, that fee may be far more than one firm deserves for the kind of work it does. A firm across the street might not be able to cover their direct labor costs for the same fee. One firm is selling a low priced product, the other an expensive one. They cannot use the same fee schedule because they are not selling the same services. The higher priced engineering job usually costs the client less in the end. The incomplete engineering job must be redone by the contractor, and this is costly. We have to sell these facts to industry.

So, if we are ever to have recommended fee schedules, we must first have standards. And standards are hard to establish. Here in Chicago we published a Code of Trade Practice, as prepared by the Chicago Association of Consulting Engineers, and if every consultant stuck closely to this Code, then we might be able to make some sort of fee schedule that made sense.

However, just as some people want low priced cars and some people want the expensive ones, so it is conceivable that some clients are always going to want "cheap" engineering while others want a full job that lets the contractor confine his activities to construction. If so, then recommended minimum fee schedules will always be meaningless — but standards would still be needed.

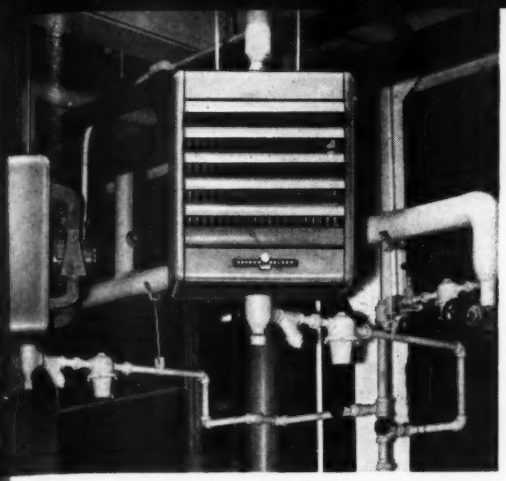
In view of this, I think the Council should devote a lot of time this year to preparing standards, and I look forward to the day when a good Manual of Practice can be published. Then, with this guide to go by, members of the various Associations will be able to set recommended fees in accordance with the extent of the job they do for a particular client on a particular project.

What Can Be Gained

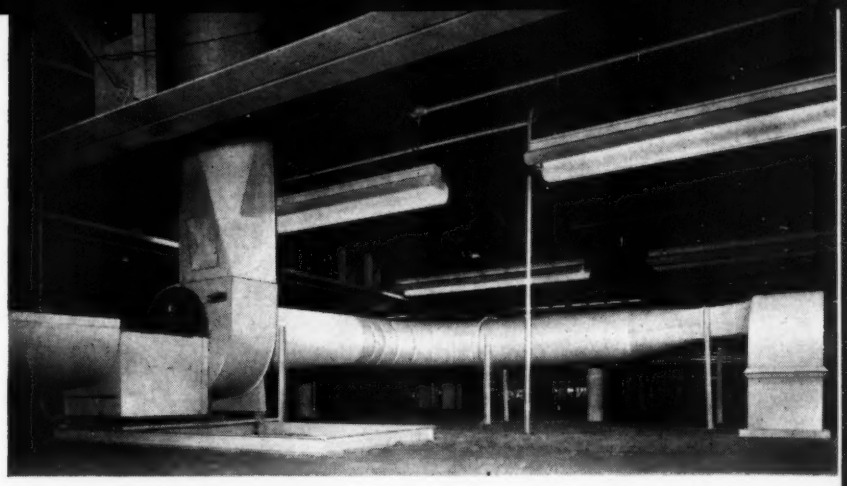
Q — Mr. Wolff, what would you say is the greatest single benefit you have gained from membership in the Council.

A — I have no trouble answering that one. Before I joined the Chicago Association, I thought the business problems I had were peculiarly my own. After I joined I found that other Chicago engineers had exactly the same problems, but I still thought they were local in nature. When we joined the Council, I found that the engineer in private practice faces the same problems, day to day, whether he is in California, Chicago, or New York. I also learned that the problems are the same whether the engineer is civil, electrical, mechanical, structural, or any combination — whether he works primarily for industry, government, or architects. Now, I am not trying to solve these problems alone. It is a lot more satisfactory to work on them with other engineers.

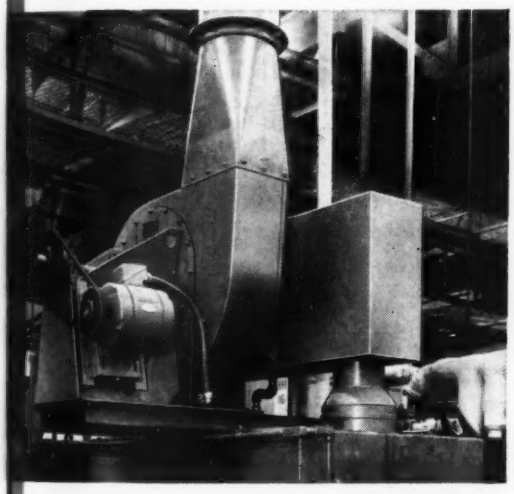
Incidentally, last summer I talked with a group of consulting engineers from Europe. Their problems are no different. ▲▲



2. A PAIR OF HERMAN NELSON HORIZONTAL UNIT HEATERS blanket a window area in the penthouse storage area at the Kokomo, Indiana, plant. Using either steam or hot water, compact in design, these heaters are available in 18 sizes.



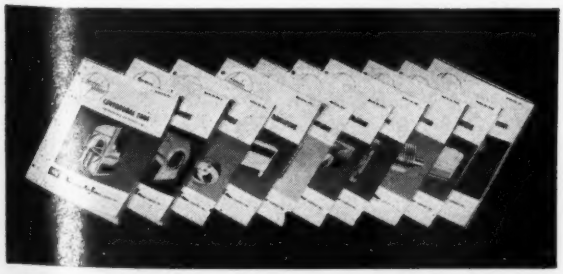
3. HERMAN NELSON UNIT BLOWER used for exhausting the manufacturing area. A completely "packaged" blower, easy to install, the unit features a hinged drive-side cover and outboard sheave that permits complete, easy-to-get-at servicing of belt and motor.



4. A NEW AAF TYPE K INDUSTRIAL EXHAUSTER provides high efficiency in various heat treating operations at the Kokomo plant. Exclusive Taper Lock Hub Assembly on this completely "packaged" unit allows fast, easy changeover on heavy-duty applications where periodic wheel replacement is anticipated. Eliminates the problem of impellers freezing to shafts.

5. HERMAN NELSON CENTRIFUGAL FAN supplying filtered and heated air to main factory area (hot blast system) at the Chrysler plant. AAF air filters and Illinois Engineering steam traps in system were included in this installation. The smaller unit in illustration is a Herman Nelson Unit Blower Size BBZK-1800, exhausting toilet space in penthouse.

6. A HERMAN NELSON VERTICAL UNIT HEATER with louver diffuser discharges air vertically downward or at angle in various directions. Located in the main factory area, it is high on the ceiling, out of the way, yet directing warm air, without drafts, wherever it is needed.



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Readers Comment

Through the Knothole

Sir:

Your recent article, "Report from Tel Aviv" (April 1957), accurately reflects the tremendous engineering tasks involved in establishing modern economies on the long neglected soil of the Middle East. As much there as at any other point on the globe, the influence of engineers and their work will help decide political and sociological problems of long standing. The huge regional projects which apparently ultimately will be needed to set the Middle East on its feet look a long ways off in view of today's headlines.

I'd like to see a series of reports on engineering throughout the southern Mediterranean countries, particularly in view of the hitherto unnoticed (by this writer, at least) mineral richness of some of these regions.

Meanwhile, I submit the enclosed photographs of construction activity in Israel. Possibly you would be interested in publishing them so that your readers could see what Philip Reed's little fellow is perusing through the knothole from his position at the head of the Tel Aviv report. It would seem that building, not knothole gazing, takes precedence in modern Israel. Judged by the people in the enclosed pictures, Mr. Reed's amusing character seems to be out of step with his fellow Israelis.

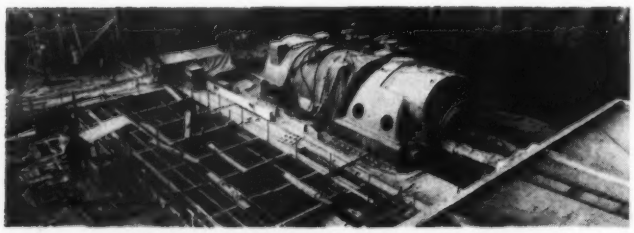
Paul Rosenthal
Consulting Engineer
San Francisco, Calif.

• SO THAT OUR READERS ALSO MIGHT SEE WHAT OUR SIDEWALK SUPERINTENDENT IS LOOKING AT THROUGH THAT KNOTHOLE, WE HAVE REPRODUCED A FEW OF THE PHOTOS MR. ROSENTHAL SENT TO US.

The European Engineer

Sir:

It has been pointed out in your magazine that Europe furnished the men who did practically all the basic research in science. Having lived in four European countries (Germany, England, France, and Switzerland) for many years before I finally settled down in the United States (1947), I feel competent to describe the training



A 50,000-KW GENERATOR IS SET IN PLACE IN A NEW POWER STATION BEING BUILT IN TEL AVIV.

THIS FIVE-MILE GULCH WAS FILLED WTH ROCK AS PART OF HIGHWAY FROM BEERSHEBA TO SODOM.

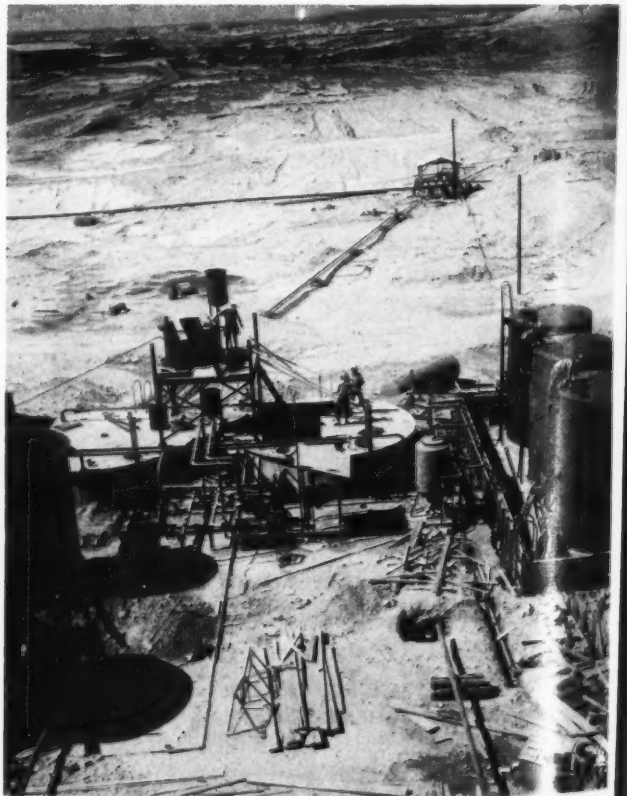


PHOTO SHOWS START OF CONSTRUCTION OF A TANK FARM AT THE DEAD SEA POTASH WORKS, IN SODOM.

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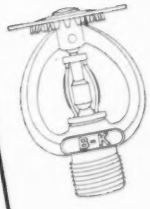

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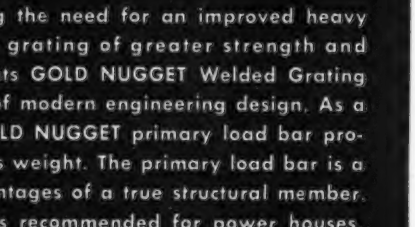

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of engineers and scientists in the advanced European nations. There is no secret in Europe's success in abstract thinking. It is all a matter of education from the day the boy enters grade school.

Long before America was discovered, European savants and luminaries, lavishly supported by royalty, aristocracy, and wealthy merchants, fostered basic knowledge. In most of Europe, teaching has been and still is considered one of the highest social functions. A call to a Chair of a faculty of a university is the crowning of any engineer's or scientist's career.

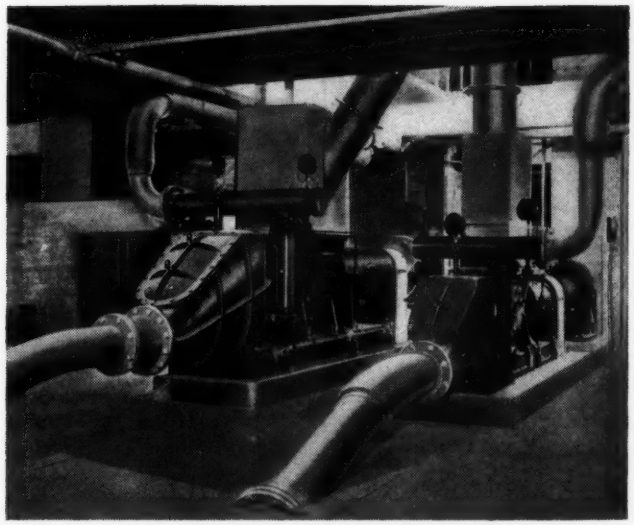
A true teacher is one who excells in one or several branches of learning. In Europe, only the best are considered good enough to teach, and this applies to the grammar school teachers (mostly married and unmarried women), as well as the college professors. The teacher's social standing, particularly that of the famed professor, is on a par with the best in the land. Their incomes are fixed by local or federal governments, and usually they are quite adequate. School teachers' salaries certainly compare well with those of unionized workmen, and college professors' incomes equal those of consulting engineers. Many professors enhance their incomes through consulting work and other professional services.

This traditional attitude toward teachers has borne good fruit. Many of the brightest students decide on a teaching career. To my knowledge, there is no shortage of teachers, high or low, and no dearth of school buildings.

For centuries, the old and venerable academies attracted the outstanding scholars, and this is still true today. Some of the scientists who taught in modern universities have become well known all over the world — Ampere, Volta, Galvani, Ohm, Bernoulli, Euler, Gauss, Cremona, Einstein, Maxwell. Many of these men belong to the genius class. They command the respect of the student body, the community, the nation, and often the whole world. There need be no mention of the quality of their teaching; they have no peer.

In European schools, discipline

Let's talk pneumatics



The art of handling dry bulk materials by pneumatic conveying has long been identified with progress in scores of modern companies whose managements recognize the importance of an efficient system for movement of materials—free of dust, contamination, and mechanical hazards.

When your requirements include a system for handling dry bulk or pulverized materials, consider the long service, efficiency, ease of installation, and installed cost advantages of an engineered pneumatic system, as compared to other methods of materials handling.

Your client may very well be ready to switch to bulk, and you can help him gain important savings through installation of a pneumatic system to receive, store, and transfer to process many of the ingredients of his products. Finished bulk products can also be moved to shipping or bulk loading.

USED IN MOST INDUSTRIES

More and more consulting engineers are specifying pneumatic equipment for moving chemicals, synthetic resins, grain, and food products—to mention a few. Unloading from trucks, railroad cars, ships, and barges, and transporting through a wide variety of in-plant operations are some of the functions pneumatics can perform better for your clients.

CALL IN YOUR PNEUMATIC EQUIPMENT SUPPLIER EARLY

Since dependable pneumatic conveying systems are engineered to fit individual requirements, it is important that the consulting engineer and a reputable conveyor manufacturer start early in the project development to select necessary equipment and design an efficient space-saving system. When the manufacturer and engineer consult while the project is still in a preliminary state, full advantage can be taken of the inherent flexibility of pneumatic conveying systems, when applicable, to provide maximum efficiency in bulk handling and overall plant design. Fuller is prepared to serve your clients through you and make available to you the benefit of 30 years of specialized experience.

HOW TO GET STARTED

1. Remember that successful pneumatic conveying systems require expert engineering assistance.
2. Write for information on systems you will want to consider.
3. Discuss your requirements with a reputable manufacturer while your project is still in the formative stage.

PRODUCTS OF FULLER COMPANY

FULLER-KINYON and FULLER-FLUXO PUMPS for conveying dry pulverized materials • FULLER-KINYON REMOTE-CONTROL UNLOADER for unloading dry pulverized materials from box cars, ships, barges, and flat-bottom storage bins • F-H AIRSLIDE® FLUIDIZING CONVEYOR for fine, dry materials • FULLER AIRSLIDE TRANSFER UNIT • THE AIRVEYOR® for unloading, conveying and reclaiming fine, granular, and crushed materials • FULLER AIRMERGE BLENDING SYSTEM • FULLER ROTARY COMPRESSORS and VACUUM PUMPS • SUTORBILT ROTARY POSITIVE-PRESSURE BLOWERS • GAS PUMPS • VACUUM PUMPS • LEHIGH INDUCED-DRAFT FANS • FULLER PREHEATER Humboldt Suspension Type • FULLER INCLINED-GRATE COOLER • FULLER CLINKER BREAKER • FULLER DRY PULVERIZED-MATERIAL COOLER • FULLER ROTARY FEEDERS and ROTARY VALVES • MATERIAL-LEVEL INDICATORS • MOTION SAFETY SWITCH • AERATION UNITS • SLURRY VALVES •

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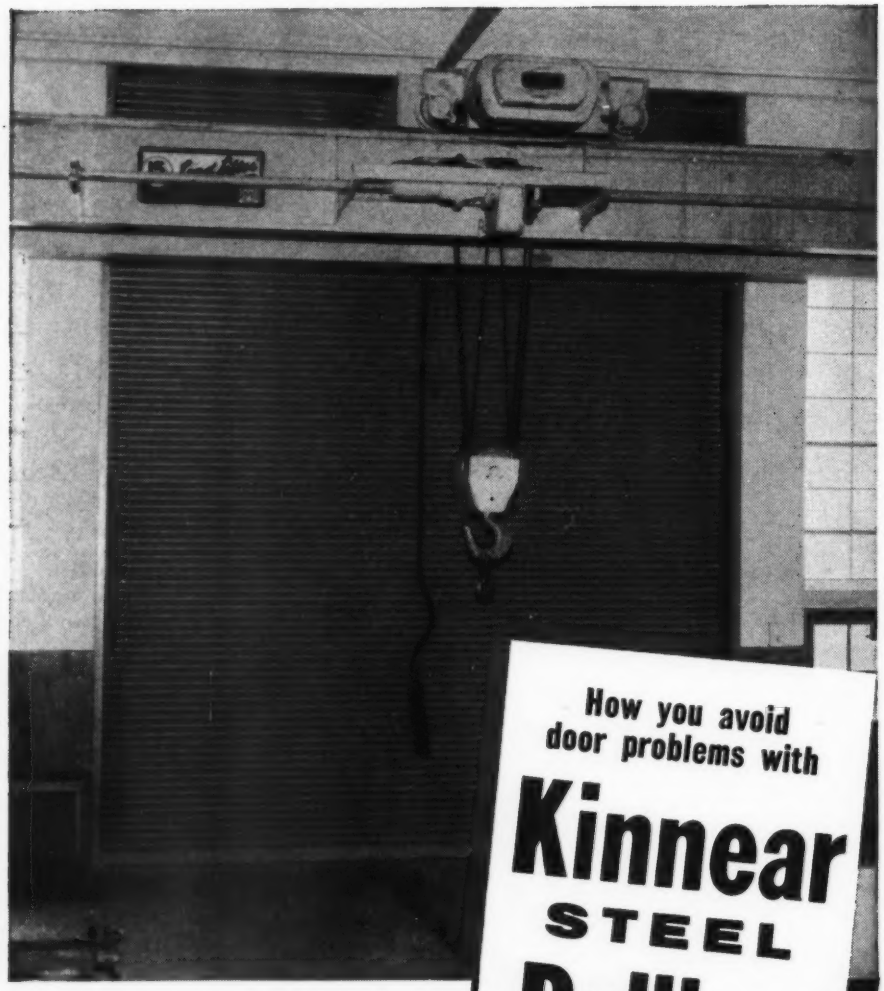


How you avoid door problems with

Kinnear STEEL Rolling Doors

There may be some risk in showing how Kinnear Rolling Doors solve so many *special* problems, in doorways like the one above.

It might give the impression Kinnear Doors aren't best for *ordinary* needs — which they are.

But in the picture above, note how the traveling crane moves right up to the face of the door. Notice the windows close to the door on either side. Also the steel supports and piping above the doorway. And the way floor and wall space is used clear up to the door jambs.

The Kinnear Rolling Door never gets in their way, and they never impede the door's action.

Because of Kinnear's *coiling upward action,* the whole curtain of interlocking slats coils into a small space above the opening. No usable room is wasted anywhere.

Kinnear *originated* this type of door, more than 50 years ago. It has been industry's first choice ever since.

The rugged all-steel curtain gives extra protection against weather, theft, vandalism and fire. It takes extra years of hard, daily use with minimum maintenance. Accidentally damaged slats can be individually replaced. Heavily galvanized *(1.25 oz. of pure zinc per sq. ft., ASTM standards)* it stands up longer, through toughest weather and climate. Its straight-line design harmonizes with any architectural style or building material.

Kinnear Rolling Doors are built any size, for motor or manual control. Write for full details, or recommendations to fit your needs.

KINNEAR ROLLING DOORS
Saving Ways in Doorways

The KINNEAR MFG. Co.

FACTORIES:
1560-90 Fields Avenue, Columbus 16, Ohio
1742 Yosemite Ave., San Francisco 24, Calif.
Offices and Agents in All Principal Cities

and a certain amount of regimentation are traditional. After about 6 years of grammar school, the classes are split into two branches. The brighter youngsters attend the Gymnasium (a super high school), while the rest enter the usual high school (often called secondary school) where they get sufficient schooling (including one foreign language) for business, craft, or trade. They also must serve an apprenticeship of from 3 to 4 years and attend supplementary arts and crafts schools.

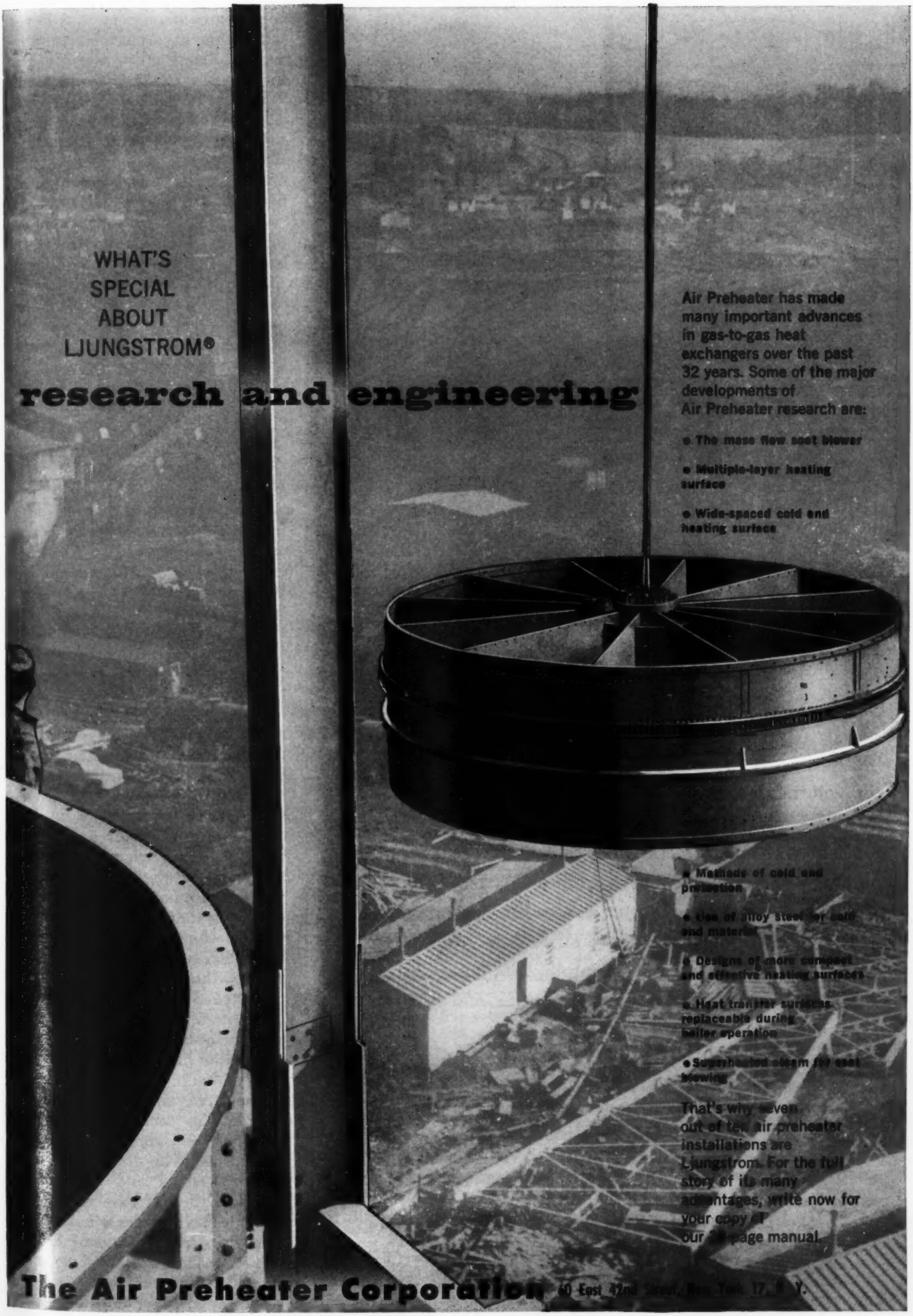
The Gym students are not bedded on roses. Many are discarded before the final exams. In each Gymnasium there are two principal sections — the literary-humanitarian-social sciences section, and the scientific section in which we find the candidates of engineering, mathematics, and medicine. The Gym education is broad and general, embracing many subjects that have no apparent relation with the future career. There is no picking of subjects on the part of the student. The curriculum is set by a governing body of professors or by the Ministry of Education.

Boys and girls who complete their work at the Gym with a baccalaureate degree are exceedingly well prepared for academic training. They are the intellectual elite and universities do not require entrance exams of them.

Most university engineering courses extend over 4½ years for a Master's Degree, and 5½ years or more for a Doctor's Degree. Great emphasis is placed on basic sciences, which enable the talented student to carry on research work. This is the supreme test of a man's ability.

A good number of European colleges (not the universities) do not require a Gym education. To them the ordinary high school standard is acceptable. However, over and above that a full-time apprenticeship in one of the crafts (machine shop, carpentry, masonry, drafting, or surveying) is compulsory. The training is geared toward the practical application of engineering sciences, and the graduate's degree is comparable to a BSc in the U.S.

The graduate university engi-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Air Preheater has made many important advances in gas-to-gas heat exchangers over the past 32 years. Some of the major developments of Air Preheater research are:
• The mass flow soot blower
• Multiple-layer heating surface
• Wide-spaced cold end heating surface
• Methods of cold end protection
• Use of alloy steels for cold end material
• Designs of more compact and effective heating surfaces
• Heat transfer surfaces replaceable during boiler operation
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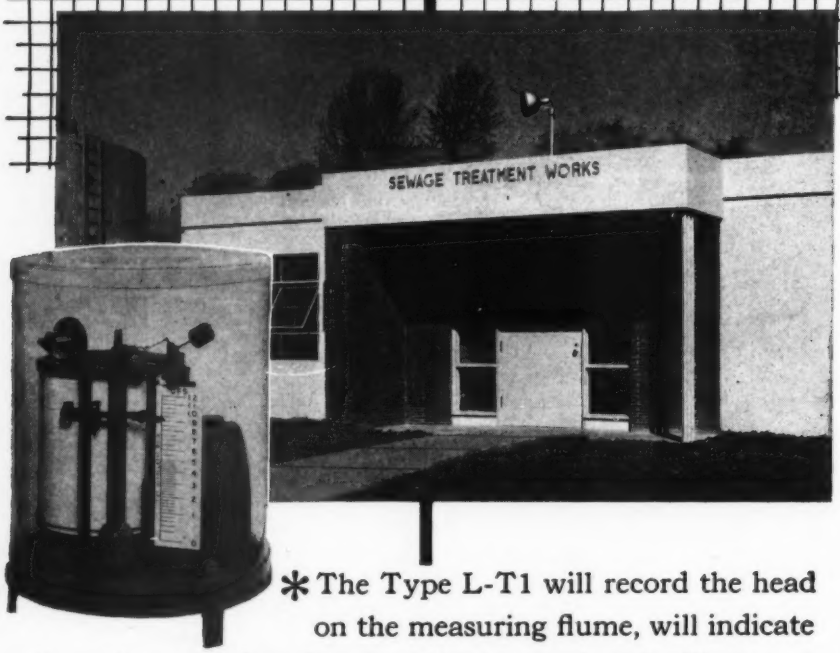
That's why seven out of ten air preheater installations are Ljungstrom. For the full story of its many advantages, write now for your copy of our 24-page manual.
The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

PROBLEM:
To obtain at minimum cost the essential information on flow required for efficient operation of a small sewage treatment plant.

SOLUTION:
Stevens Type L-T1 Recorder*



*The Type L-T1 will record the head on the measuring flume, will indicate the volume of flow for any time interval and will give an instantaneous reading of the rate of flow. The head record, made on convenient rectangular coordinates, is basic information for permanent record from which plant operators and State Sanitary Engineers can check flows and volumes. The volume reading from the totalizer dials and the rate of flow indicator are essential for intelligent operation. Readings can be made in any desired volume and flow units.

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144 pages of technical data on recorder installations... plus a wealth of hydraulic tables and conversion tables. **Send $1.00 (No C.O.D.'s)**

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neer begins his career at a lower salary than his American counterpart, and not until recently has there been much improvement. However, he gains experience and stature and the European engineer's income rises faster than that of the equivalent U.S. engineer. On the whole, older European engineers receive better incomes than American engineers in the same class, and they also enjoy a higher social standing in their communities and among other professions. Such careers act like magic on teenagers. The peak enrollment at universities and colleges speaks for itself.

Frank D. Steiner
Orinda, California

Designing Concrete Members

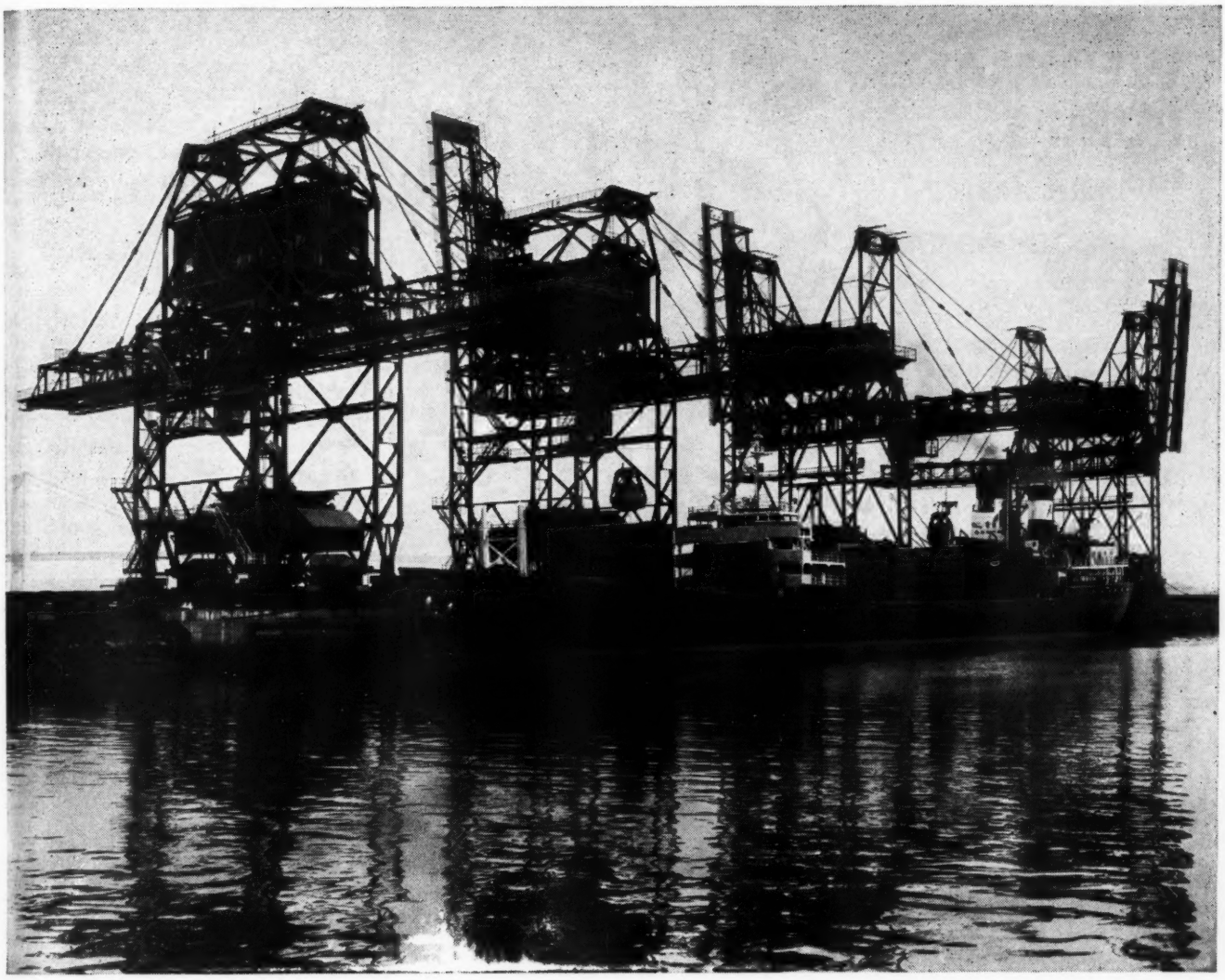
Sir:

During a period of employment with Sverdrup and Parcel, Inc., I found the method of designing concrete members by assuming the neutral axis to be employed with modifications which, I believe, simplify the procedure. (See "Designing Concrete Members," CE, April 1957.)

Rather than taking the moment arm about the assumed location of the neutral axis, it is taken about the compression face of the member. The statical moment for C_1 and T_1 thus remains constant throughout the change in the assumption of the value of kd. The only item that requires change is C_1 to reflect the change in the assumption for the value of kd.

A 4th column is added which is the moment of inertia of the various components of the member, obtained by multiplying the area by the square of the distance from the compression face of the member to the centroid of the area in question and adding the moment of inertia of the area with respect to its centroidal axis

The area and moment of inertia of the section can thus be tabulated and applied in the flexure formula obtaining the compressive stress and the tension stress in the extreme fibers. The point of zero stress should coincide with the location of the assumed neutral axis. If it does not coincide, the value of kd is again assumed and it is only necessary



Dravo builds second 1800 ton per hour unloader for PRR

In July 1955, Dravo finished an 1800 ton per hour man trolley unloader for Pennsylvania Railroad's giant ore pier at Greenwich Point, Philadelphia, operated by The Pennsylvania Tidewater Dock Company. Its trouble-free operation and tonnage handling capacity led to the ordering of a second Dravo-built ore unloader within six months. This unloader began operation 370 days after it was ordered.

These heavy duty machines use an adjustable voltage system for maximum horsepower output and fast handling cycles. The average cycle time is 45 seconds, but Pennsylvania Tidewater's skilled operators frequently lower that time to 36 seconds. A 20,000-ton ore ship is unloaded at the pier in less than seven hours. Two such ships can now be unloaded simultaneously.

Dravo heavy materials handling equipment is at work in steel mills, power plants and other materials transfer points. Each piece of equipment is designed to provide fast, smooth operation with maximum efficiency and low operating cost.

For information about Dravo's complete line of trolleys, bridges, towers and other related equipment, write for Bulletin #225. Better still, let us arrange for your visit to actual installations. Simply call us at Pittsburgh, Spalding 1-1200, or write DRAVO CORPORATION, PITTSBURGH 25, PENNSYLVANIA.

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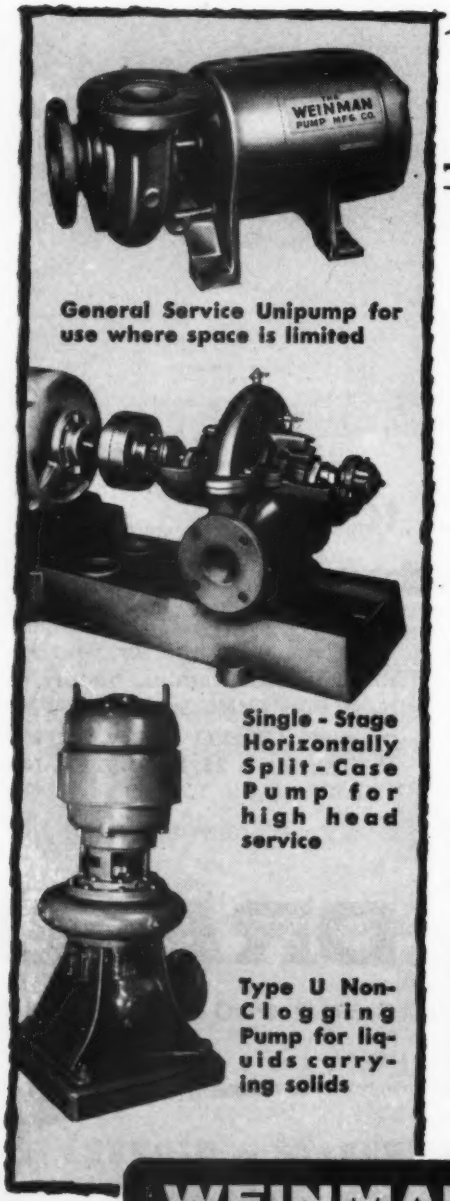
CORPORATION

Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

with
WEINMAN
PUMPS,
too . . .

TOP
PERFORMANCE
COUNTS!



General Service Unipump for use where space is limited

Single-Stage Horizontally Split-Case Pump for high head service

Type U Non-Clogging Pump for liquids carrying solids

The outstanding feature of a truly great ballplayer is his ability to turn in above average performances, day after day.

So it is with WEINMAN PUMPS. Day in, day out, rugged, dependable WEINMAN PUMPS turn in top-notch performances wherever industry encounters liquid handling problems. Just what does this mean to you and your plant operations? It means lower operating costs, less maintenance expense, less downtime due to pump failure. And WEINMAN PUMPS cost less to buy, too.

Be smart . . . don't pay big league prices for minor league pumps. Make sure you get the league's top performers . . . sturdy WEINMAN PUMPS. They're designed right and built right to operate right.

See your nearest WEINMAN Specialist for full information. He'll be glad to help you solve your plant's pumping problems. You'll find his name in the yellow pages of the phone book. Or write, wire or phone us direct.

THE WEINMAN PUMP MFG CO
290 SPRUCE ST. COLUMBUS 8, OHIO

to change the value of C_1 and find the new moment of inertia and area and the stresses until the values coincide . . .

Harold J. Jobse
Brown Engineering Co.
Des Moines, Iowa

Misleading Term

Sir:

In reading over your Staff article on these problems in the May 1957 edition ("The Problems of Private Practice"), the term "free engineering" came up several times. This term is misleading and in the interests of the clients as well as the consulting engineers and the equipment suppliers the matter should be reviewed and then revised.

There is no such thing as "free" engineering or drafting. An equipment manufacturer or vendor who provides drawings or other literature charges the ultimate consumer, generally the client. These drawings usually are made by an engineer or draftsman and the expense is part of the "overhead" charged to the sale of the equipment itself.

Consulting engineers can attack this problem by finding a new term for it, possibly "manufacturer's engineering and drafting costs," or some better term. There must be several. But the term "free" shouldn't be used. Very often an equipment supplier is asked to make several additional drawings to sell certain equipment, and this so-called "free" design work hurts. A drawing requiring over one hundred hours for completion can easily cost him $500 or more. Consulting engineers and suppliers can help each other by pointing out to the client that drawings are expensive.

A client may very well think twice before insisting on such service if it is pointed out to him what the costs really are.

The consulting engineer, on the other hand, should alert the client to these costs which are sometimes disguised under another heading.

John J. Mahoney
Consulting Engineer
New York, N.Y.

General Electric 480Y/277-Volt Distribution System Permits $50,000 Savings at New Sheraton Hotel

MODERN HOTEL COMBINES FLEXIBLE LOAD CENTER SYSTEM, HIGH VOLTAGE LIGHTING TO CUT EQUIPMENT, INSTALLATION COSTS

Rising 22 floors above Philadelphia's Penn Center, the ultra modern Sheraton Hotel combines the latest in construction details with an efficient high voltage electrical power distribution system which is currently being installed in many commercial buildings.

Designed to provide maximum comfort and services for hotel guests, the new Philadelphia Sheraton Hotel has incorporated a General Electric 480Y/277-volt electrical system which permitted savings of $50,000. To design this modern system, G-E engineers worked closely with consultants Slocum and Fuller; and architects Perry, Shaw, Hepburn, and Dean. The electrical contractor was Keystone Engineering Corporation. One feature of the system is the installation of G.E.'s new quiet, dry-type, general purpose transformers. These low-noise-level transformers add further comfort for Sheraton Hotel guests.

From primary switchgear at the incoming line through secondary distribution and protective apparatus, General Electric system-engineered equipment provides highly reliable power at the Sheraton.

To see how General Electric can help you achieve significant savings with a 480Y/277-volt electrical distribution system, consult your nearest G-E Apparatus Sales Office or write to General Electric Company, Section 680-11, Schenectady, N. Y.

Engineered Electrical Systems for Commercial Buildings

GENERAL ELECTRIC

FLEXIBLE double-ended load center unit substation with integrated units furnishes highly dependable power close to load.

COMPACT low voltage switchgear and distribution switchboard protect low voltage side of "packaged power" system.

QUIET General Electric dry-type transformers, with low-noise-level characteristics, help improve sleeping comfort for Sheraton guests.

DECORATIVE LIGHTING enhances main ballroom. High voltage lighting in many areas of hotel permits low-cost use of combined light and power system.

COORDINATING THE PROJECT were M. Savitt of Slocum and Fuller, H. Cohen and L. Evelev of Keystone, T. S. Duff of Slocum and Fuller and A. M. Cook, G.E.

Scraps & Shavings

DURING THE PAST FEW YEARS the major engineering societies have been fitting themselves into their proper position in the scheme of things. Ten years ago, the Founder Societies were riding the crest of a wave of ambition to be all things to all engineers. Passing the crest they leveled off, and another wave rose behind them. This was N.S.P.E., on not quite so ambitious a wave, perhaps, but still not sure of what heights it might reach.

This has changed. Now the engineers of this country have come to expect the Founder Societies to be the collectors and disseminators of engineering knowledge. Their annual meetings are devoted primarily to the presentation of technical papers, and their publications are doing an outstanding job of publishing the results of technical engineering research and development.

On the other hand, American engineers are now turning regularly to N.S.P.E. on matters having to do with their position as professional men. N.S.P.E. is doing an outstanding job as a professional organization. It has been the prime mover behind registration, both from the aspect of increased registration and the aspect of adequate legislation in the states. N.S.P.E. has done much to establish the professional prestige of the engineer; it has aided his efforts for better pay and proper recognition within his company; it has guided and pushed him toward professional dignity; it has protected his rights as a professional person.

Basically, we have here a situation in which the Founder Societies can best serve engineers by generally confining their activities to the encouragement and publication of engineering knowledge. Similarly, N.S.P.E. can best serve its members by concentrating on service to the engineer as a professional person. That is about all most engineers need. Engineers employed by government, educational institutions, or industry could not ask for more.

The consulting engineer is somewhat different. He has a further set of problems. He operates a business, and this means that he not only is a professional man who uses engineering knowledge, but he is also a business man with business problems. He must sell his services, he must establish the price he will charge, he must collect his bills, pay his operating expenses, and make a profit. These problems have nothing to do with professionalism. They are the same problems faced by an automobile dealer or the owner of a grocery store. The engineer, himself, is professional, but his business is strictly business. The consulting engineer must be registered, and he may abide by a professional code of ethics, but no partnership, no corporation, no firm of any type can be registered or even read a code of ethics. There is no such thing as a professional *firm*. Professionalism is a characteristic of an individual, not of a business.

The consulting engineer wears two hats: he is a professional engineer, yet he is a business man. He will not be one for long unless he is the other.

Therefore, the consulting engineer needs an organization to deal with the business problems of his firm. The bankers have such an organization, the electrical manufacturers have one, and so do almost all other types of businesses in this country.

This is where the state and regional associations of consulting engineers fit in. They are not designed to deal with encouragement of knowledge, they do not hope to handle the professional status of the engineer or any of the problems of the engineer as an individual. Instead, these associations — and their national federation, the Consulting Engineers Council — are interested in the business problems of the owners and managers of engineering firms.

These are basically business problems, problems of commerce and trade, collections and accounts receivable. The Founder Societies and N.S.P.E. should not deal in these fields — and should not want to deal in them. They are business matters having nothing to do with either technical knowledge or professional development.

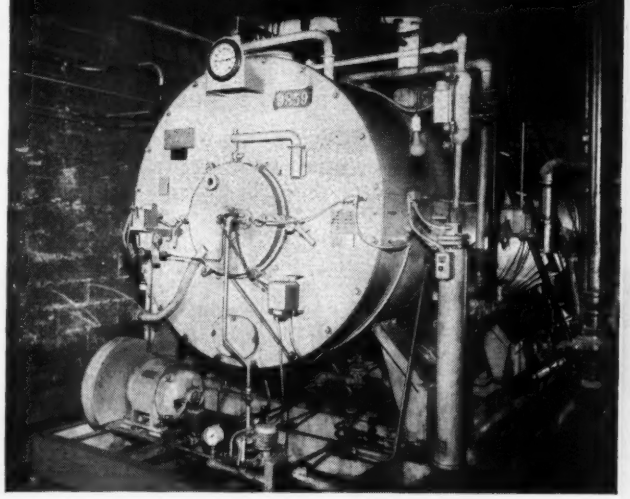
In actual fact there is no overlap of proper activity among any of the three, and each group should try to stay in the field in which it can serve its members best. It is a mistake for the Founder Societies to involve themselves too much in the "personal status" side of engineering, as has been proven by several magnificent bumbles of the past. It is also wrong, we think, for N.S.P.E., a society made up of engineers from every field, both employers and employees, to involve itself in the nonprofessional problems of business firm management. These problems are within the scope of a business association, not a professional society.

It would also be wrong for the Consulting Engineers Council to involve itself in the dissemination of technical knowledge or in the problems of the engineer as a professional person. ▲▲

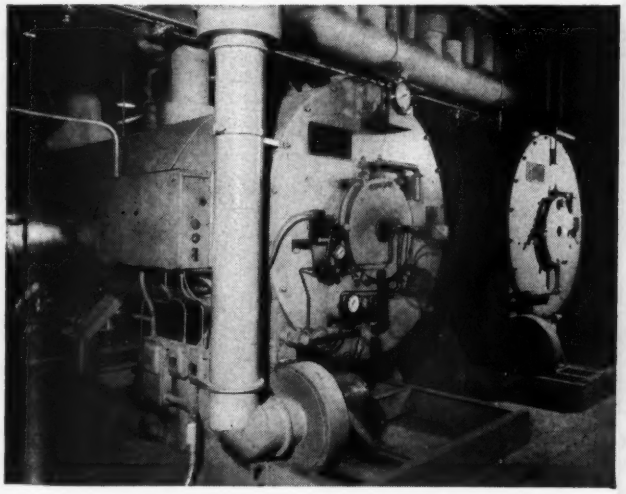
STEAM GENERATING PROBLEMS SOLVED

. . . a report

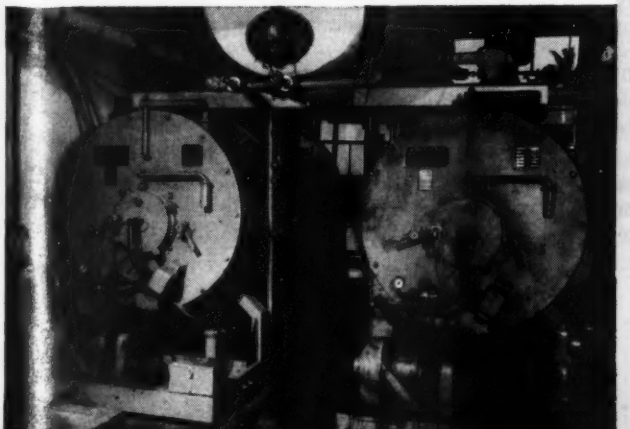
by AMESTEAM GENERATOR



Dependable steam supply for a food processing plant by a compact, automatic Amesteam Generator.



Supplying dependable heat for a large Junior-Senior High School — two efficient Amesteam Generators.



Variable steam requirements for a laundry ably met by these space-saving, easy-to-operate 60-HP Amesteam Generators.

LABOR SAVING ALONE PAID THE COST of the AMESTEAM GENERATOR installation in the plant of Victor Preserving Company. Writes Vice-President Donald E. Tobin:

"We have all the steam we need, when we need it, and, of course, the operation of the boiler is very much cleaner and simpler than our former boiler . . .

The saving in labor alone has more than justified the installation of the AMESTEAM GENERATOR to say nothing of the convenience and day after day dependability. The next time we need another new boiler, you can be sure it will be an AMESTEAM GENERATOR."

"CLEANER, VERY DEPENDABLE AND ECONOMICAL" writes Supervising Principal Charles Knapp about two AMESTEAM GENERATORS installed at Griffith Institute and Central School in 1955.

"We find them much cleaner, of course," reports Principal Knapp, "and we are also well pleased with their very dependable and economical performance. As you know, we still have coal fired boilers in the older buildings, so we have a chance to make a direct comparison."

"SIMPLE TO OPERATE . . . MINIMUM SERVICE . . . HIGHLY EFFICIENT", is the way Mark Denburg of Mark's Quality Cleaners & Launderers, Inc., describes his A-60 AMESTEAM GENERATORS.

"We can highly recommend AMESTEAM GENERATORS", writes Mr. Denburg, "to anyone considering the purchase of a steam generator. Our experience has been that they are simple to operate and require a minimum of service. They are highly efficient from a fuel standpoint and we are well pleased with them. You may feel at liberty to bring a prospective customer to see these units any time."

WHAT'S YOUR STEAM PROBLEM? If you need 10 to 600 HP and want the kind of space-saving, trouble-free service enjoyed by these owners of AMESTEAM GENERATORS, write today for our catalog and the name of your nearby AMESTEAM dealer.

AMES IRON WORKS INC.

BOX P-67 OSWEGO, N.Y.

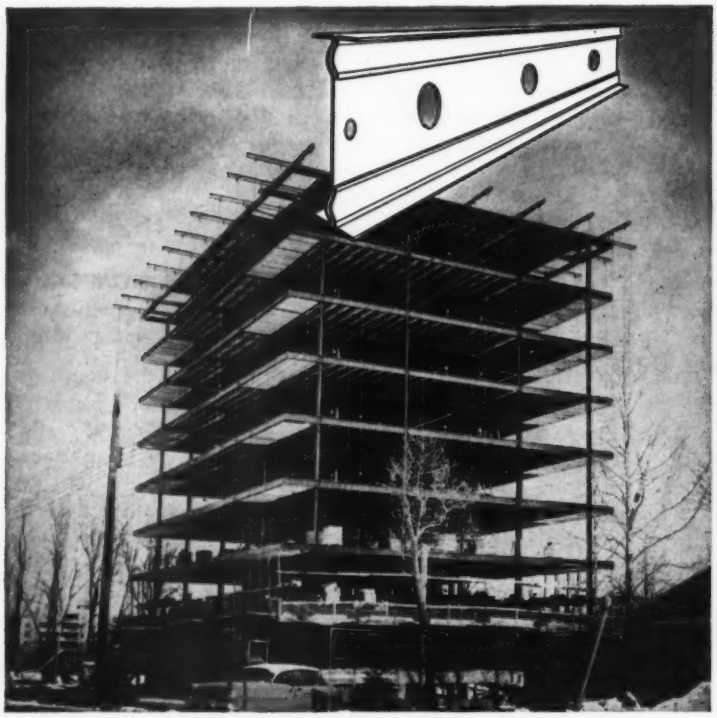
NOW *Stran-Steel offers a complete lightweight* joists, studs, columns, decking

Stran-Steel now offers a complete structural system with fully integrated components—nailable joists and studs, structural columns and beams, roof decking and the beautiful new metal curtain wall panels with *Stran-Satin* finish.

Stran-Steel's complete structural system brings these advantages to the engineer, architect and owner:

VERSATILITY—Many structural variations are possible with this versatile system in the design of walls, roofs, partitions, canopies, floors, even entire buildings. A few are illustrated below.

ECONOMY—Savings in the use of steel architectural products mean more economical construction, resulting in lower bids to fit budget limitations.



Eight-story luxury-type apartment building, New York City. Builder: Alfred Levitt.

New Maximlite-designed Northeast Elementary School, Findlay, Ohio. Design by: John Auferoth.

NAILABLE JOISTS AND STUDS—Stran-Steel joists are light gage steel members formed from strip steel and welded back to back to form the special nailing groove. They provide a non-combustible, economical and permanent framing system to which collateral materials can be quickly and easily applied. Available in 6″, 8″, 9″, 10″ and 12″ depths and in gages of 12, 13, 14 and 16. This range of depths and gages satisfies almost any load requirement.

The distinctive nailing groove permits rapid installation of collateral materials. Ordinary nails can be used and tightly clinched in a grip of steel, yet can be readily removed with a claw hammer.

STRUCTURAL COLUMNS AND BEAMS—Stran-Steel cold formed members are "C" section shapes and are available in special steel having a yield of 40,000 p.s.i. These sections are manufactured in a variety of sizes and can be used in many combinations as structural columns and beams. Stran-Steel cold formed sections are strong and durable, yet provide weight-saving and cost-saving economies. They are available in 8″, 10″, 12″ and 14″ sizes and gages ranging from 6 to 14.

NEW WIDE FLANGE STRUCTURAL SHAPES—Eight choices of wide flange I-section structural shapes are now available: Two with 6″ flange, 8.62″ and 9.62″ in depth; six with 8″ flange, ranging from 8.75″ to 12.75″ in depth.

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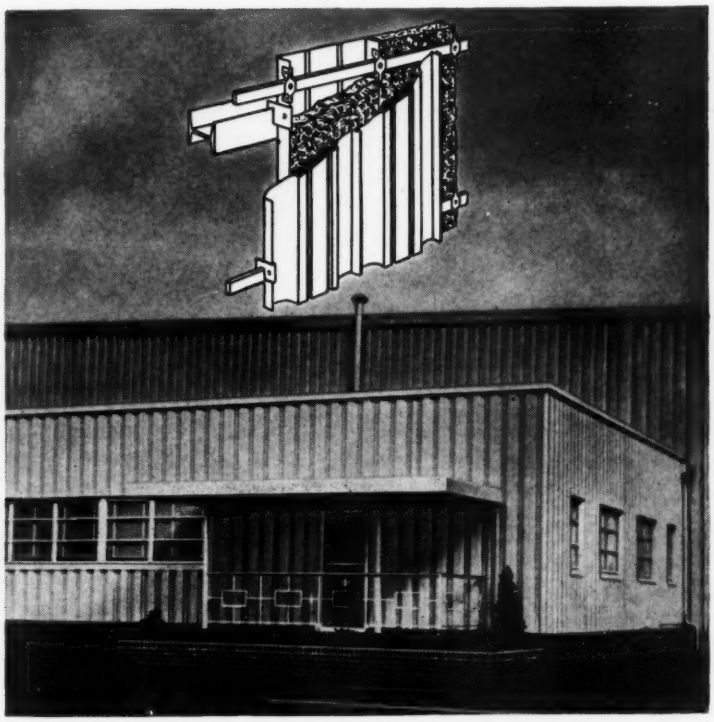
structural system—

and curtain wall

STRENGTH—Stran-Steel nailable joists, for example, have a yield point of 40,000 p.s.i., approximately 20% higher than that of most commercial mild steel. This extra-strength weight advantage prevails throughout the range of these products.

Stran-Steel products are ideal for schools, apartments, shopping centers and industrial plants.

Cleveland's Parkland, $50,000,000 residential and shopping community. Project developer: Don Loftus. Architect: Wm. E. Harris.



Large, modern warehouse, Oakland, California. Owner: Bigge Drayage Co. Engineers: D. Y. Long Co.

RIBBED ROOF DECK—Stran-Steel galvanized ribbed deck is designed primarily for use with Stran-Steel joists. However it is also useful as sidewall skin in certain applications. Two types are available:

1. Lightweight, nailable roof deck with ribs on 4" centers. Available in 22, 24 and 26 gage, live load carrying capacities range from 32 to 206 p.s.f., depending on gage, with spans from 2' to 4'.
2. Heavier roof deck for longer spans has ribs on 6" centers. Available in 18, 20 and 22 gage. Live load carrying capacities range from 12 to 267 p.s.f., depending on gage, with spans from 3' to 9'6".

CURTAIN WALL—Stran-Steel curtain wall, made of exclusive *Stran-Satin* panels, combines a satin-smooth surface free of bright spangles along with the permanent protection of a non-corrosive zinc coating. It provides the low cost of steel with the eye appeal of far more expensive materials.

Stran-Steel curtain wall consists of two basic panels, insulation and concealed fasteners. This wall is quickly assembled on the job simply by using a button punch. Panels are never pierced or marred by bolts, screws, rivets or holes. Curtain wall panels are available in 18, 20, and 24-gage steel, in lengths up to 54 feet.

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The Word *from* Washington

EDGAR A. POE
Consulting Engineer Correspondent

THE Jenkins-Keogh bill, designed to encourage voluntary pension plans by self-employed individuals, is pending before the House Ways and Means Committee, but no hearings have been scheduled thus far. The proposal would allow consulting engineers and other self-employed a deduction from federal income taxes for limited amounts set aside for retirement funds.

Under the present social security law, a tax deferment is permitted employed persons whose employers have established approved employee pension plans. Because self-employed engineers cannot be their own employees, they cannot qualify under existing legislation.

"This bill," said a member of the committee, "has considerable merit and is being given a great deal of study. It is difficult to say at this time what the ultimate fate of the bill will be. However, it is getting late for it to be passed in the current session — if there is a chance of passage at all."

THE Department of Labor is continuing its efforts to have Wage and Hour jurisdiction over consulting engineers. Secretary of Labor James P. Mitchell has on file with the Fourth Circuit Court of Appeals a petition seeking reversal of the ruling by Judge Walter E. Hoffman in the Eastern District of Virginia. ("Scraps and Shavings," April 1957).

Earlier in the year the district court ruled in favor of Lubin, McGaughey and Associates, a partnership of consulting engineers and architects. The Labor Department had complained that the firm was violating the Fair Labor Standards Act provisions pertaining to overtime and record keeping.

A labor department spokesman said in filing notice of appeal, "We are adhering to our original position, and are confident that we are on sound grounds." The appellate court is not expected to hear arguments in the important case until sometime in the autumn.

GENERAL Services Administration says that designs and plans for nearly 100 post offices and federal buildings authorized by Congress are continuing. A spokesman said that GSA wants the plans ready when the program is resumed so bids can be invited immediately for construction and financing. The program was suspended earlier in the year — assertedly because it would contribute to inflation.

GAIL A. Hathaway, former president of the American Society of Civil Engineers, has assumed the post of engineering consultant for the World Bank, Department of Technical Operations.

OPPOSITION is mounting before the Senate and House District of Columbia Committees in connection with pending proposals that would exempt electrical contractors and master electricians from the District of Columbia Professional Engineers' Registration Act.

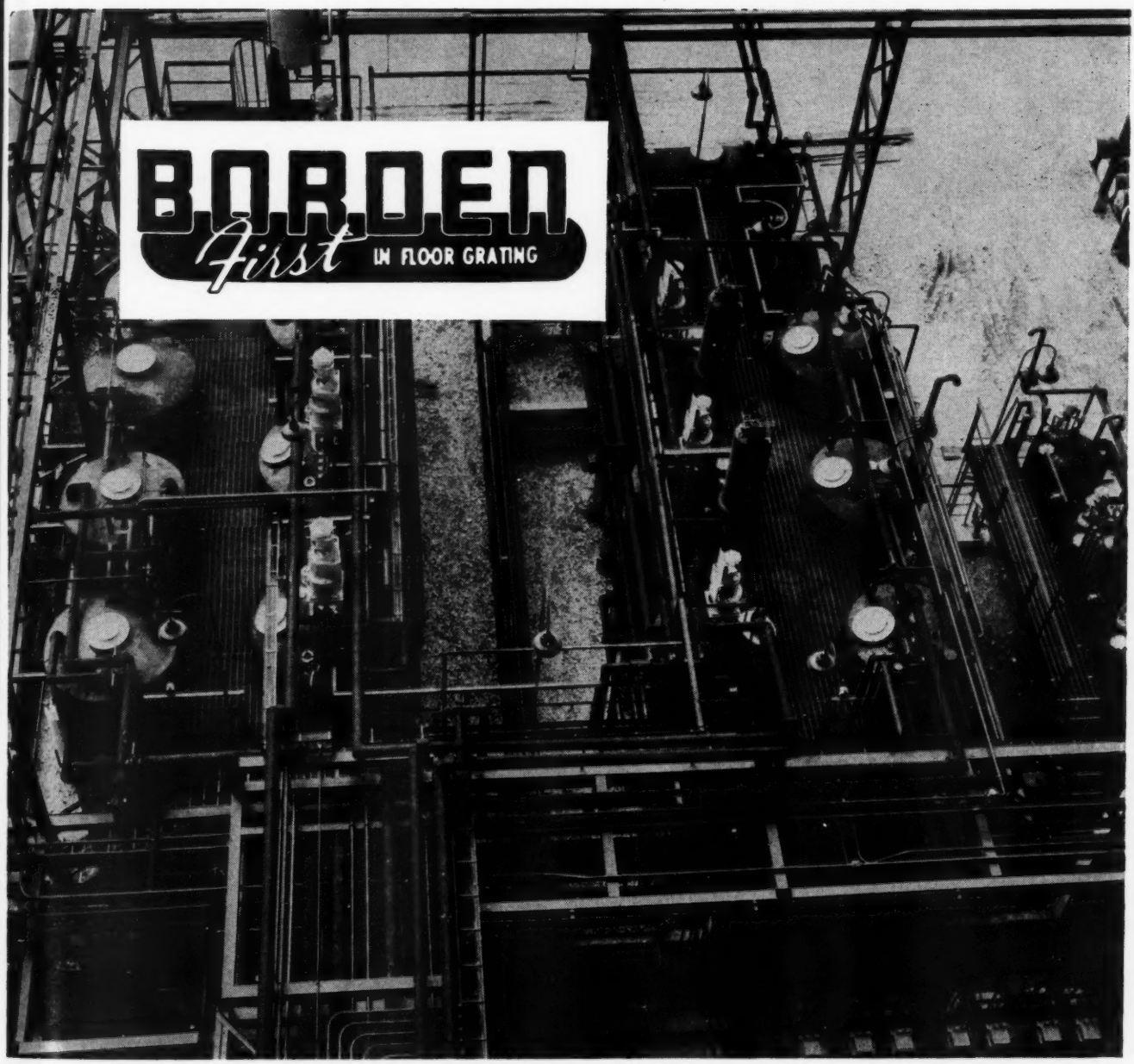
Four members of the Maryland delegation, Senators J. Glenn Beall and John Marshall Butler and Representatives DeWitt S. Hyde and Richard E. Lamkford introduced identical measures. They would permit electrical contractors and master electricians to plan and diagram all sizes of electrical projects without being registered engineers.

While the proposal would affect directly only the District of Columbia, opponents contend that if enacted it could pave the way for similar exemptions in the states, thus causing a setback in progress in engineering registration.

FEDERAL expenditures for civil public works, exclusive of the highway aid program, appear likely to exceed $1.75 billions for the 1958 fiscal year despite the economy wave gripping Congress. Estimated public works expenditures for 1957 will total $1.466 billions, while 1956 spending amounted to $1.054 billions.

SCIENTIFIC Manpower Commission reports that the engineering manpower shortage continues tight in most fields.

Its survey says engineering graduates are in greater demand than ever before. Recruiters for large corporations came off the campuses a year ago with about two-thirds of the personnel needed. This year they are having to be satisfied with some 60 percent of the engineers needed although a greater number are graduating than in 1956.



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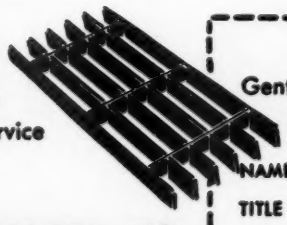

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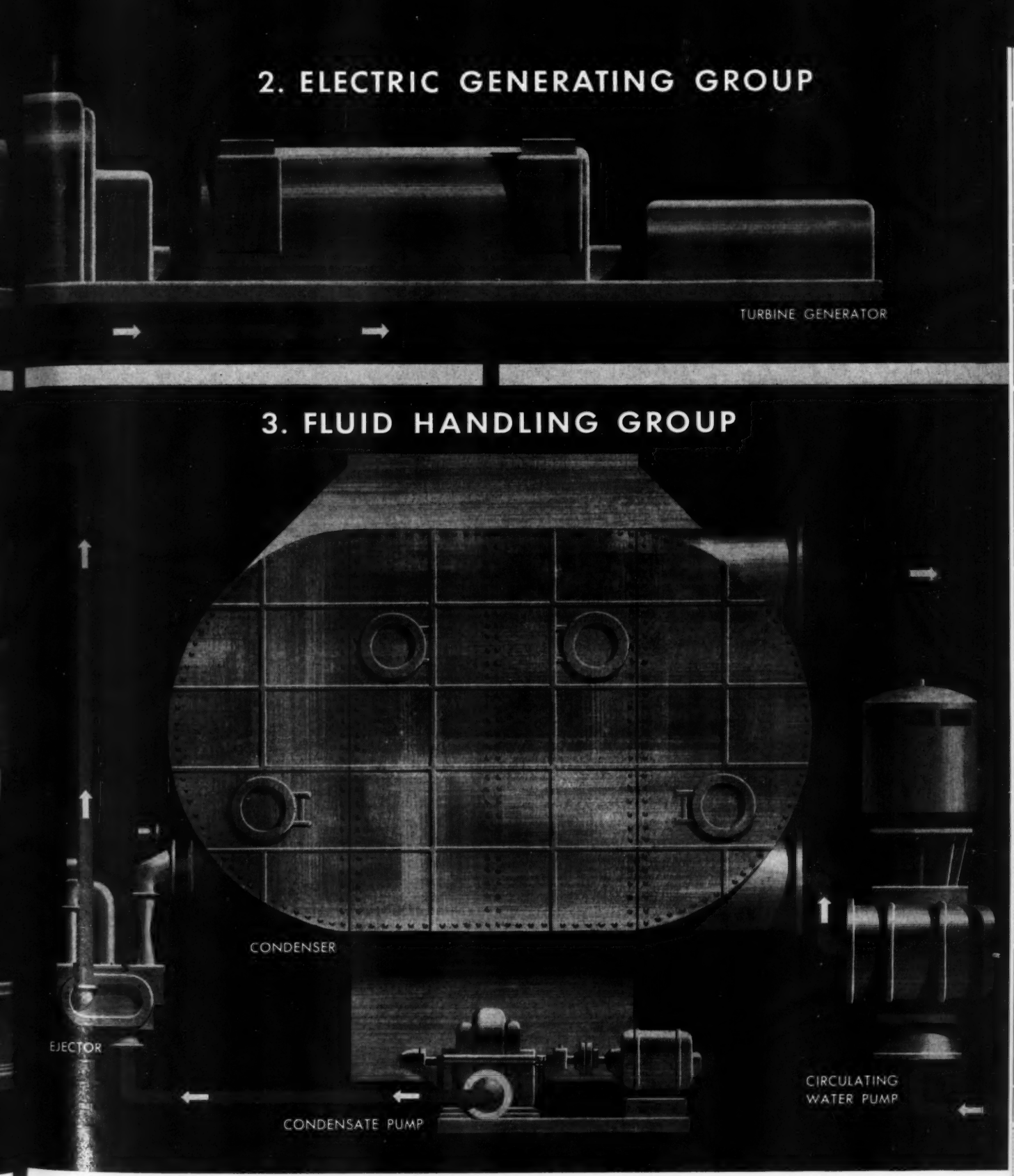

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The Reader's Guide

Council Coverage

There are three items in this issue that deal in some way with the affairs of the Consulting Engineers Council. This is appropriate, for the Council held its first Annual Meeting, in Minneapolis, early in May. Ed Wolff, of Chicago, was elected president, and his job will be to follow-up on the excellent work begun by John Pryke, of New York, the Council's first president, who continues to serve on the Executive Committee. Some of Wolff's ideas as to the job ahead for the Council are well expressed in his own words in this month's "Cover Story." There is also a report on the actions of the Council at its first Annual Meeting, starting on page 118, and there are some thoughtful comments on the current state of engineering associations to be found under the heading "Scraps and Shavings" on page 26.

Corporate Practice

Back in February of this year we published an article "We Oppose Corporate Practice," by James P. O'Donnell, of New York. Mr. O'Donnell gave good reasons for feeling that engineering should be done only by sole ownership firms or partnerships. Now we can study the reverse of the coin. General L. J. Sverdrup, of Sverdrup and Parcel, St. Louis, feels that the corporate firm, where it is permitted by law, can offer a number of advantages for engineers in private practice. Since General Sverdrup heads both a partnership and a corporation he is in a position to speak with some authority on the matter. His article, "Why We Favor Corporate Practice," will be found on page 110.

How to Cut Your Taxes

About six months ago we heard about an engineer who was getting sizeable tax deductions on his income from foreign projects in the Western Hemisphere. It seems he was working through a subsidiary organization known as a Western Hemisphere Trade Corporation. We came back to the office and called an attorney to see just what a Western Hemisphere Trade Corporation is all about. He had never heard of one — but being a good attorney he put us in touch with someone who did. Edward Kenney, Attorney at Law, not only knew about Western Hemisphere Trade Corporations, he did further research to find out just how these corporations could be used by consulting engineers. As a result, we are carrying his article in this issue, the first in which the subject has been explained from the consulting engineer's point of view. This is no small matter. If you are doing or plan to do any work outside the United States but in the Western Hemisphere, here is a way you can cut your taxes on that income just about in half. It could be worth a few hundred thousand to you to turn to page 92, and read "Increase Your Income With a Western Hemisphere Trade Corporation."

As Others See Us

Last month we carried an article based on part of a survey made for the Consulting Engineers Association of Oregon. It told what engineers thought of their own situation — how they saw themselves. It also presented opinions of architects and contractors — those who work closely with consulting engineers. This month, in another article, "As Others See Us," the survey continues, this time showing what clients and prospective clients think of the engineer in private practice. Questionnaires went to manufacturers and various government groups. The report concludes with comments from engineering professors and students, and then there is a summing-up of results of the whole survey by the public relations group that conducted it. This starts on page 88.

Thin Shell Design

Shell structures are no longer familiar to us simply as "one of those strange buildings designed by some foreign, *avant-garde* architect." Nearly every city of any size has a church, a supermarket, or an auditorium built from a shell design. M.I.T. is so full of them that some visting old grads have to be treated for shell-shock. Many of the most beautiful of these structures were designed by Boyd G. Anderson, of Ammann & Whitney. In his article, "Designing Thin Shell Structures," on page 78, he explains how shell design should be approached by the engineer, and he backs up his ideas with some excellent photographs of designs developed by his firm.

Not So Dark Continent

There probably is no part of the world that offers so much opportunity for the consulting engineer as Africa. But we must be more specific than that, for Africa is not a harmonious whole. The American engineer stands very little chance, for example, of getting a project in Egypt, or even in the French areas, and the Belgian Congo is so industrially tied to the mother country, that you would have little chance of getting a job except through some international agency. That still leaves an enormous area in which there is a shortage of engineering skill, a strong desire for industrial progress, and a friendly attitude toward the United States. While British engineers have been doing most of the work in those areas, there is no reason the American engineer should not offer his services and secure some of the work. To get an idea of the opportunities, read Peter Holz's "Report from Africa," starting on page 60.

Transportation Problems

As our population continues to increase, as we produce and consume more goods, the need for an adequate transportation system becomes more obvious. Railroads complain that they are losing money on passengers and losing freight business to the trucks. Railroads sincerely believe they have been holding the dirty end of the stick ever since the last Eastern Railroad was stolen while the Grant administration was investigating Western Railroads. The truckers think they are paying the way for every sports car on the Los Angeles Freeway, and every coastal shipper thinks he is personally covering the cost of dredging the St. Lawrence Seaway. The airlines are ready to get back on a subsidy. Behind all this recrimination and counter-recrimination is the federal government, which through one agency or another sets the rate structures; and both the federal and state governments, who levy the taxes. If transportation in this country today is still private enterprise, it is so only in a very special sense. Every aspect is government controlled. This means that the solution to the problem of getting the transportation system we need is no simple matter of adding more trains, ships, trucks, or planes. To get some idea of what is involved and what we can do about it, see "Transportation—Can We Solve Its Problems?" by C. E. Childe, transportation consultant, of Washington, D.C. His article starts on page 100.

Architectural Lighting

Exterior floodlighting of buildings is a field in which the engineer and the architect must work together. While it is true that more and more of the work on a monumental building is basically engineering rather than architectural, no one will argue with the fact that the façade, the external appearance, are the architect's creations. So if the building is to be lighted at night, it should be up to the architect to decide what effect is to be achieved. But when the architect has decided what he wants, the engineer must provide it for him. The engineer must decide what type and size lamps to use and where to place them to get the desired effect. This is strictly an electrical engineering problem. Most floodlighting projects are not difficult, but few consulting engineers have experience in that type of work. For a few hints, see R. E. Faucett's article, "The Engineering Aspects of Architectural Floodlighting," starting on page 72.

The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

Atomic Energy Law (Legal Liability for Injuries)

There is nothing in the Atomic Energy Act that pertains directly to legal liability for injuries to persons or property arising out of the operation of nuclear reactors. That does not mean that there is no law on the subject. It means that although there is much law on the subject, we do not know what it is. In other words, it is not statutory but is based on the common law, or case law. Of course there have been no cases arising out of atomic energy accidents, since there have been no such accidents as yet. But the law is full of general principles and of analogous situations which may or may not apply. In other words, not only is atomic energy a potential blessing to men of good will all over the world, but it also looks as though it will be a great delight and benefit to lawyers.

The Lawyers' Stand

There has been a considerable amount of interest and debate among lawyers on this subject of legal liability for atomic energy accidents. About half the lawyers say that because of the uncertainties and inadequacies of present tort doctrines as applied in atomic energy, "there ought to be a law." The other half, however, neatly meet this argument by saying that these uncertainties were good enough for our forefathers and they should be good enough for us, and what are you, a radical or a professor or something? The other half (some of them evidently voted twice) say that everything should be left to a jury to work out, and there is no need for lawyers to worry their heads over all this confusion. We have muddled through before and we undoubtedly will muddle through again.

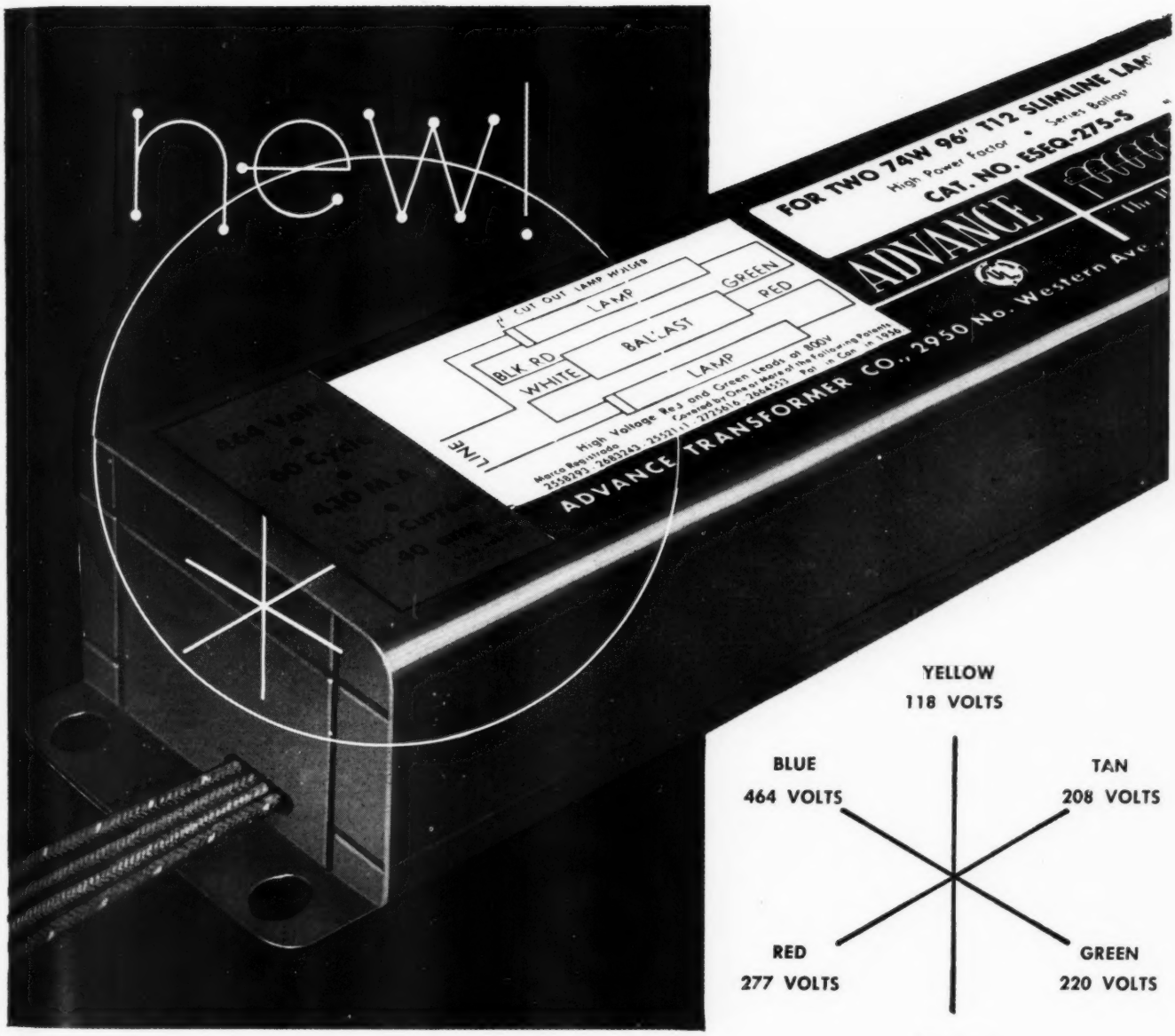
However, our hypothetical corporation, which will have to operate a prototype reactor, must know in advance how much insurance they will need in order to protect them against liability for accidents. They cannot know this if the law is practically 100 percent uncertain. Therefore, let us take a brief look at some of the apparently uncertain or unsatisfactory areas of this law.

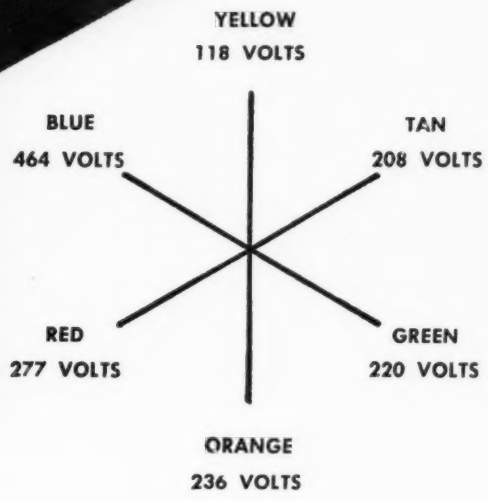
Liability to Community

In the event of a catastrophic accident to a nuclear reactor that breaks the outer envelope surrounding the shielded reactor, the public at large will be exposed to radiation. Although it appears impossible for a nuclear reactor to blow up like an atomic bomb, there is no guarantee that, under a combination of unexpected adverse circumstances (something goes wrong in the reactor and the scram button gets stuck), a great deal of radiation will not be let loose. It is estimated that under such conditions (which are unlikely to materialize often), damages to the public might be of the order of $200 to $900 million.

Strict Liability Doctrine

If we eliminate the ordinary grounds of tort liability, namely intention to injure or negligence, then our problem is whether there is liability on the ground that atomic energy operations are ultra-hazardous. Such a ground of liability is known at the common law although the boundaries of such strict liability are very uncertain. In the first place, it may be argued that atomic energy activities are not ultra-hazardous, in view of their safety record, which excels that of any other industry. The answer to this is that, although the probability of an accident is minute, the results of a serious accident could be catastrophic. Therefore, even taking into account the extreme smallness of the probability of an accident, there is a very substantial risk to the public. It is therefore believed by most lawyers, though not all, that atomic energy activities will be classed as ultra-hazardous and will fit within the doctrine of strict liability, or "liability without fault."





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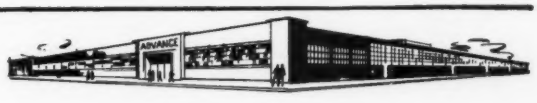

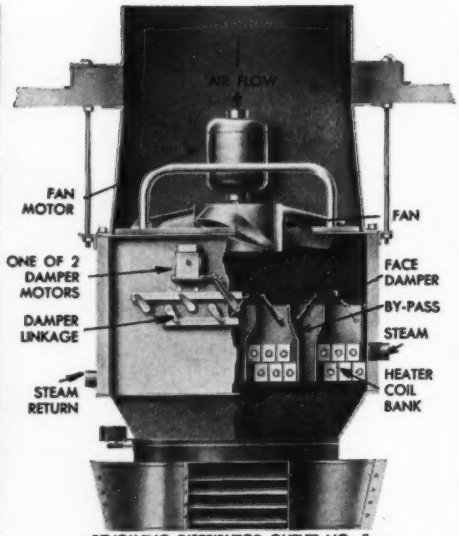

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Assuming the operation of nuclear power reactors to be within the strict liability doctrine, the next problem is that of exceptions to the rule. Even then there is no liability unless the accident is the "proximate cause" of the injury. The doctrine of "proximate cause" is undoubtedly one of the vaguest in the law. "Proximate" simply means "not remote;" but what *is* too remote is likely to be a question for the jury to decide. For example, suppose the prevailing wind direction is such that radiation can be expected to blow out to unpopulated areas and cause little damage. Then suppose that after the accident, the wind shifts, and blows the radiation over a populated district fifty miles away in an improbable direction. Is there liability, or is this an "Act of God," or an "unforeseeable intervening cause"? These are nifty questions. But there are no nifty answers.

For Example

Now, suppose Mr. Smith brings a suit against our corporation for radiation injury. He was exposed to the radiation, and since that time he has found he does not "feel so good." Can he prove a case? Suppose Mrs. A proves she has a low blood count. Did she have one before the accident? And, just exactly what are their damages? Will they become really sick eventually? Will they contract cancer? Will their lives be shortened? Suppose they can prove radiation damage, how do we know they did not get it from some medical or other source? Suppose Mrs. A gives birth to a malformed child after being exposed to radiation. Does the child or does Mrs. A have an action? If so, how do we know that this mutation was not brought on by natural radiation, or by some other cause?

If you will now suppose that there are a million such claimants, you can begin to see that we may have difficulty in getting enough unirradiated judges and juries, and also enough money, to be able to litigate the claims, to say noth-

Unretouched photo of dissolved oxygen attack in steam condensate return lines.

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The "growths" you see on the interior of this condensate return line are known as tubercles. Beneath each tubercle is a cavity or pit in the metal surface—the result of concentrated, localized attack by the corrosive water. Water containing dissolved oxygen has converted metal on the pipe's interior to iron oxide, causing a buildup of corroded material. The velocity of the water flowing through the line is not sufficient to remove the tubercles, so they continue to grow larger and larger.

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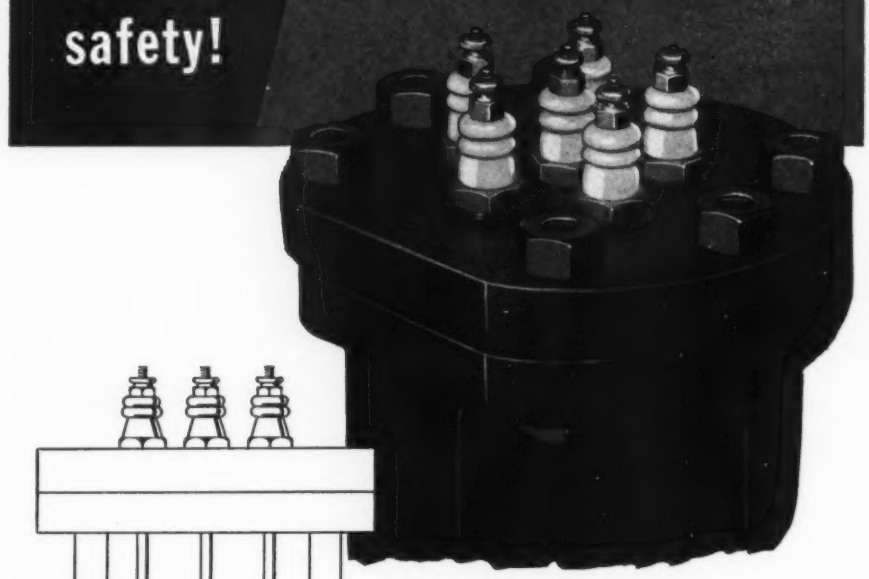

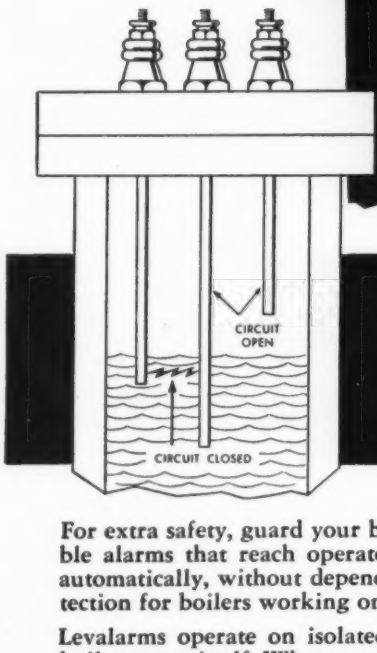

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BOILER SAFETY DEVICES

ing of being able to pay them.

It may be asked why these claimants cannot wait until the extent of their injury, if any, is ascertained before bringing their suits. The answer is that the Statute of Limitations rules out their suit before then, for you must bring your action within a certain number of years after the accident occurs, and not after you discover the extent (or even the existence) of your injury.

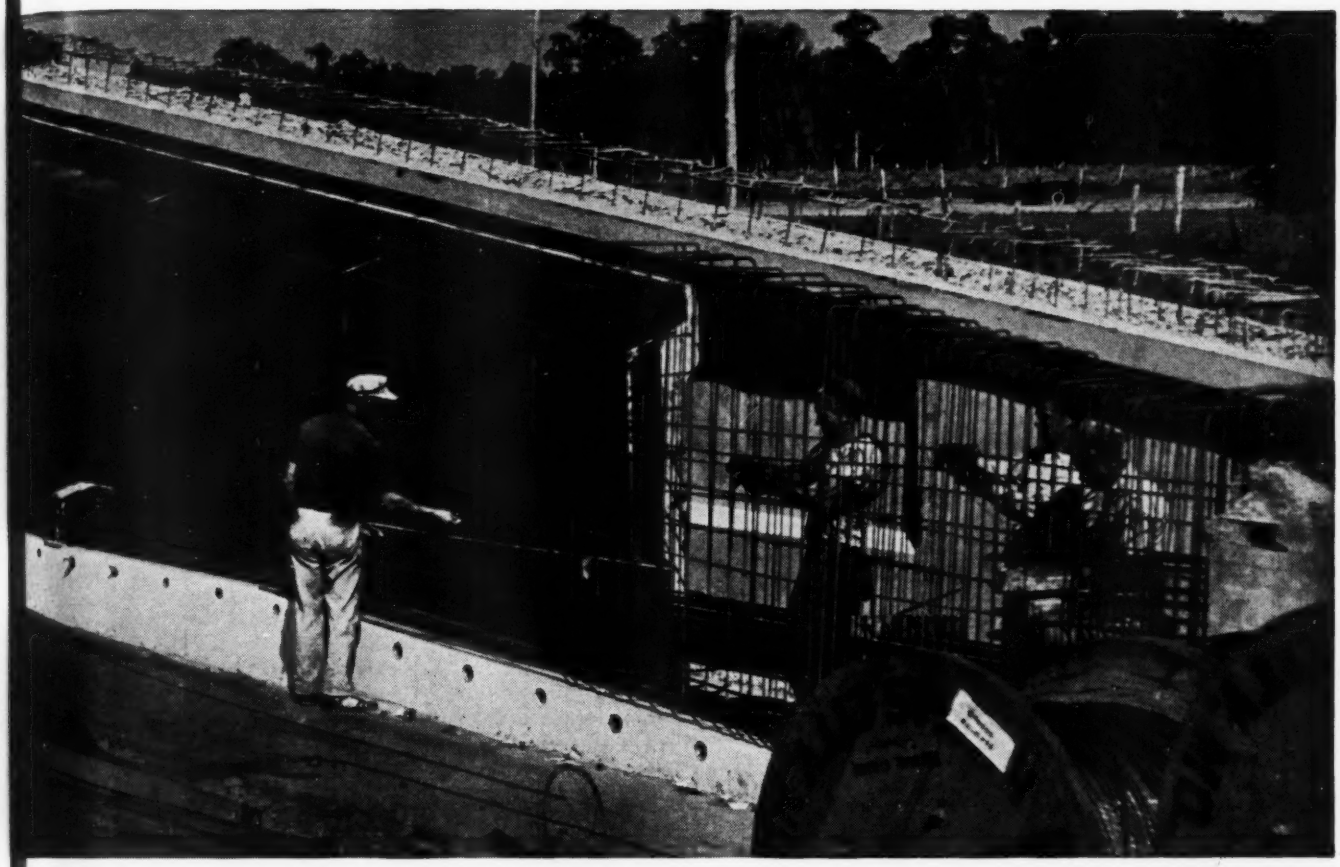
Liability to Employees

Medical care and services are generally provided, in Workmen's Compensation Acts, for a period of only a few months to a year, and this may not be enough for radiation injuries.

In the event that a man is exposed to radiation on two different occasions, each exposure under a different employer, the compensation provided under the workmen's compensation laws is not satisfactory. In each instance, he may have a relatively small amount of radiation exposure, but since radiation damage is in some respects cumulative his total injury is greater than either of the two individual injuries. In general, this is not satisfactorily taken care of under present Compensation Acts.

Occupational diseases generally are not covered in Workmen's Compensation Acts in a way that would apply to atomic energy workers. The laws are generally too specific, and normally do not include radiation exposure as a separate occupational disease. Furthermore, if no loss of earnings occurs, there is no compensation despite the fact that the lifespan or the working lifespan may be reduced. This is not very satisfactory either.

Thus, workmen's compensation laws will need to be overhauled. Since we do not know now how they will operate in the future for atomic energy cases, this simply makes the amount of insurance coverage needed that much more uncertain and tends further to interfer with progress. ▲▲



and the concrete cast progressively from one end of the casting bed to the other.

Union **TUFWIRE** Strand Used 100% In These Girders

As long time specialists in high carbon wire, the Union Wire Rope organization stepped sure-footedly into pioneering the technological development of stress relieved, high tensile wire and strand for prestressing concrete. Just as sure-footedly it has expanded research and production facilities to keep well ahead of the demands of the 300% yearly growth of the prestressed concrete industry.

We're geared to the needs of this amazing prestressed concrete industry—and geared for its future growth.

Today we're supplying Tufwire Stress-Relieved Wire and Strand to projects ranging from the largest in history's biggest highway building program . . . right on down to poles and farmers' fence posts. The orders don't come too big or too small. You can be sure of prompt delivery from our strategic Mid-America location.

Have a problem? Whether you're already an on-site contractor or a permanent casting-bed operator—or are exploring the potential of prestressed concrete in your area —get in touch with our engineering department and research laboratories.

Would you like to have a reprint of a recent Tufwire advertisement which has been called "a primer of the prestressed concrete industry"? It distills the whole big story of prestressed advantages into 10 minutes of thought-provoking reading. It is a summary of fundamental facts supplied by a panel of prestressed fabricators and consultants who pioneered in the industry and have grown with it. Write for your copy today!

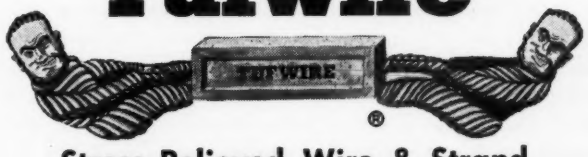
Small buildings, too, share the advantages and economies of prestressed concrete construction. This eye appealing shelter house in a park will minimize vandalism and be remarkably easy on maintenance costs. Compare the speed and facility of erection when structural members are mass-produced and delivered complete instead of laboriously being cast on the site.

UNION Tufwire Is Protected Against Rust and Corrosion

All shipments of Tufwire Strand are safeguarded against corrosive effects of dampness, salt air and damaging fumes. Another big Tufwire "plus"!

union

Tufwire



Stress-Relieved Wire & Strand

union Wire Rope corp.

Specialists in high carbon wire, wire rope, braided wire fabric, stress-relieved wire and strand.

2308 Manchester Avenue **Kansas City 26, Missouri**

ATOMS IN ACTION

HOWARD J. CADWELL, president of the Western Massachusetts Electric Co., suggested in a speech before the AIEE meeting in Pittsfield, Mass., that when atomic plants begin to produce power commercially, cost might be decreased by taking advantage of off-peak hours to store heat electrically in water or chemicals for space heating or to raise water into storage reservoirs for future use by hydroelectric plants.

WALTER KIDDE Nuclear Laboratories, Inc. and George G. Sharp, Inc., New York marine design firm, will design the first atomic powered surface ship for the U.S. Maritime Administration. Work includes hull design, nuclear shielding, ventilation, instrumentation, and controls. The power plant will be a pressurized water reactor similar to the one employed in the "Nautilus."

CORROSION, a major problem in the atomic energy field, will be studied by engineers at Westinghouse by means of two new test loops designed specifically for testing materials used in reactor facilities. Each of the loops consists of a system of stainless steel pipes containing a fluid that can be pumped around test specimens placed inside the system. Temperature, pressure, and velocity of flow of the fluid can be controlled closely. Main function will be study of the corrosive effects of hot, pressurized fluids on structural materials. The loops will be used for development and testing of corrosion inhibitors, corrosion resistant alloys, and corrosion resistant joints in structural materials. They will operate at pressures up to 2000 psi and temperatures up to 600 F. Fluid is circulated by a canned-motor pump.

BURNS AND ROE, Inc., New York City, are working on preliminary design of facilities to test nuclear aircraft propulsion equipment for the Atomic Energy Commission. Primary purpose of the facilities will be full-scale developmental testing during which components of nuclear aircraft propulsion plants will be assembled, tested, dismantled, and analyzed. The designs are scheduled for completion by the end of this year.

A SYMPOSIUM on radiation effects on materials has been included in the program of the 60th Annual Meeting of the American Society for Testing Materials, to be held at Atlantic City June 16-21. The three sections will deal with "Consideration of Radiation Effects in Design," "Radiation Facilities and Techniques," and "Radiation Effect Studies of Materials."

THE AMERICAN STANDARDS ASSOCIATION has been assigned the secretariat of a group being organized by the International Organization for Standardization to formulate a plan for standardization of techniques in applying nuclear power to industrial uses. Representatives from ISO member countries will meet in Geneva, Switzerland, in the latter part of July.

EXPERIMENTS conducted by the University of Illinois Engineering Experiment Station on the effect of radioactive substances on anaerobic decomposition of sewage sludge indicate that radioactive materials in concentrations up to 200 millicuries per liter do not produce an inhibitory effect on sludge digestion. Fission products having levels of 110 microcuries per liter did indicate an inhibitory effect. The full report is available from the University, as bulletin No. 441, for 80c.

WESTINGHOUSE has decided to go ahead with its plan to construct the first industry owned nuclear materials testing reactor. Construction of the WTR was delayed late in 1956 while the project and its relation to the company's atomic power development program was re-evaluated. Site will be Waltz Mill, Pa., 29 miles southeast of downtown Pittsburgh.

GAMA RAYS from radioactive cobalt are being employed to detect and control the level of molten titanium in a new "cold hearth" arc furnace designed to prepare purified titanium metal at the Westinghouse metals development plant at Blairsville, Pa. The system is so precise that it can detect and maintain the level of the titanium ingot to within 1/100th of an inch of its ideal operating position. If the ingot moves beyond its prescribed limits, the gamma ray control causes immediate shutdown of the furnace. Although developed expressly for this installation, the control system is expected to have application to other types of furnaces and in other position measuring and leveling applications.

A CERAMIC CORE of fused pellets of uranium oxide and thorium oxide, developed at Argonne National Laboratory, shows promise as a new fuel element for atomic reactors. The fuel element, now under test in

STRONGER and SAFER for every high pressure pipeline duty...

...because they are **drop forged by Vogt**

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Constantly imitated but never duplicated, Vogt drop forged steel fittings and flanges have unmatched strength and toughness for your most severe pipeline duties. Laboratory controlled materials and Vogt's special forging techniques assure products which are always uniform in structure, fine grained, and free from porosity. Thereby the shocks and stresses imposed by high pressures and high temperatures are easily withstood, and with stubborn resistance to erosion and corrosion. Consult Catalog F-9 for our complete line of fittings and flanges.

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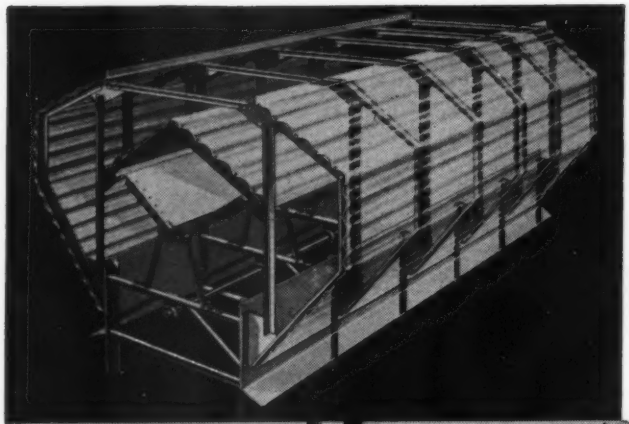
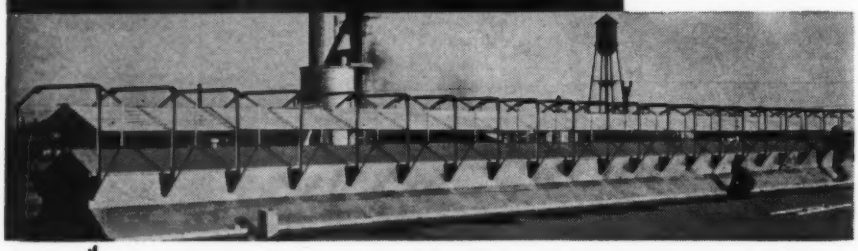


TOP — The Burt Monovent Ventilator. Sizes to 96" throat — continuous runs, as required.

BELOW — Burt Monovent on The S. K. Wellman Co. plant during erection by Industrial Roofing & Sheet Metal, Inc., Cleveland. Engineer — Vincent Eaton Cleveland. Architect—Charles Bacon Rowley & Associates, Inc., Cleveland. Contractor —Albert M. Higley Co., Cleveland.



110 FOOT BURT MONOVENT EXHAUSTS HEAT AND SMOKE FROM THE S. K. WELLMAN COMPANY ADDITION

The S. K. Wellman Company's new 120' x 240' addition to their Bedford, Ohio plant required highly efficient ventilation to remove smoke and heat from metallurgical processing equipment. The solution—this 110' Burt Monovent Continuous Ridge Aluminum Ventilator, with 72" roof opening, quickly exhausts hot, stagnant air uniformly along the entire building. Center hinge butterfly type dampers and the fixed top form a cone-shaped airflow section that provides broad, simple air flow lines, eliminating numerous air passes and attendent friction losses. The Burt Monovent is economical to install, operate and maintain and highly efficient.

Send for **FREE** *Data Book!*

Write for Burt Data Book SPV-17. It supplies quick data on Burt's complete line of modern Roof Ventilators.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

919 S. High Street Akron 11, Ohio

MEMBER POWER FAN MANUFACTURERS ASSOCIATION

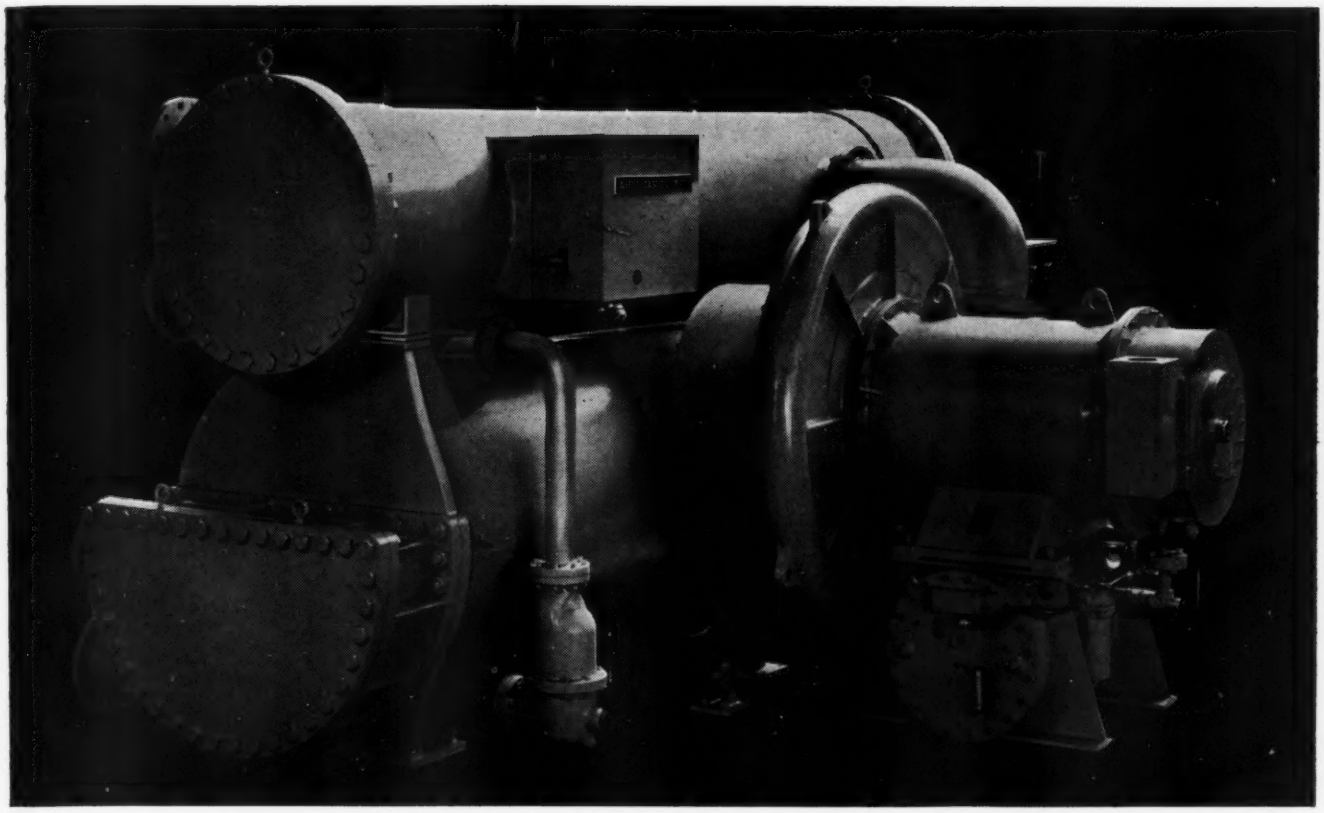
the BORAX-IV at Argonne, has good resistance to corrosion in both water and sodium-possium liquid metal; does not increase in size to the extent that metallic fuel elements do when exposed to intense radiation; and withstands high temperatures.

SUMMER COURSES in the atomic energy field are to be offered by Massachusetts Institute of Technology this year. The first course is "Nuclear Reactor Technology," from June 24 to July 5, covering nuclear theory, physics, and engineering. The second is "Principles of Radioisotope Utilization," from July 8 to 19, designed for engineers, basic research workers, and those in the medical sciences. Detailed information is available from the Office of the Summer Session, Room 7-103, MIT, Cambridge 39, Mass.

EXPLAINING INCREASED COST of its Shippingport PWR reactor power plant (from the original estimate of $37.5 million to $55 million), AEC told the Joint Committee on Atomic Energy that the core size has been increased by about 20 percent, with a subsequent need for more control rod drives, fuel element assemblies, and more extensive core instrumentation. X-ray examination of the stainless steel pump volute and valve castings turned up numerous faults that necessitated extensive reworking. AEC also pointed out that original estimates of buildings and facilities required were low because of lack of information on design and layout at the time they were made. Also, the waste disposal system has had to be doubled in size.

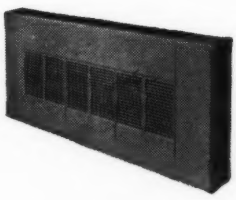
WITH A PLANT COST of $55 million and turbine generator costs of $15 million, the cost per installed kilowatt at the 60,000-kw Shippingport plant comes to $1167. Comparable figures for the 5000-electrical-kw EBWR at Argonne, and the 2000-ekw APPR at Fort Belvoir, the only two operating atomic power plants in the U.S., are $1228 and $1720 respectively. Increased size, apparently, is not resulting in significantly lower cost.

THE ANDERSON-PRICE indemnity bill has been reported out by the Joint Congressional Committee on Atomic Energy. Action was precipitated by a statement from vice president Charles J. Haugh of the

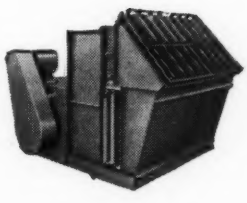


TONRAC® — single-stage hermetic centrifugal refrigerating machine — maintains chilled-water temperature *regardless of load.* Single-level construction simplifies installation.

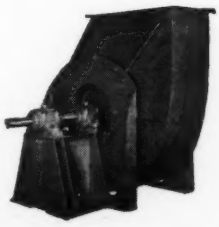
You'll get one-source responsibility from American Blower's complete air-conditioning line



Compact and easily accessible, American Blower Inductor Units are available for both high- and low-pressure systems.



American Blower line includes Multi-Zone Conditioners, plus central-station units and self-contained packaged air conditioners.



Sirocco® High-Pressure Fans are part of the complete American Blower package for high-velocity, high-pressure air-handling systems.

American Blower offers a complete line of air-conditioning products which are designed, engineered, and manufactured to work together. Whether it's for a small installation or a large-scale central or zone system, you can specify *all* your equipment from a single source — pinpoint responsibility for quality, performance, delivery dates. You'll save time and money doing it — and you're assured of a balanced system!

Point is, for every air-conditioning and air-handling requirement, there's an efficient, dependable product backed by American Blower's 75 years' experience. From self-contained packaged units and heating and cooling coils to Tonrac Centrifugal Refrigerating Machines, you get the finest when you specify American Blower. Why not get in touch with our nearest branch today! American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

AMERICAN BLOWER

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WAGENER PUMPS

FIT JOB REQUIREMENTS

Wagener pumps meet all requirements for power source, capacity, pressure, viscosity and resistance to abrasive and corrosive actions on each job. They are sturdily built for trouble-free pumping. Self-sealing pumcup packing and divided piston rods reduce maintenance costs to the minimum. They are available in price ranges suitable to anticipated usage. Delivery and service are prompt. Send for details . . . today.

Wagener simplex and duplex pumps in both piston and plunger types can be engineered to job specifications for pumping anything that can be pumped:

ACIDS
ALCOHOLS
ASPHALT
BEER MASH
BRINE
BUTANE
CREOSOTE
DYES
GLUE
GROUT
LARD
LIQUOR
MILK
MOLASSES
OILS
PAINT
POTATO MASH
PROTANE
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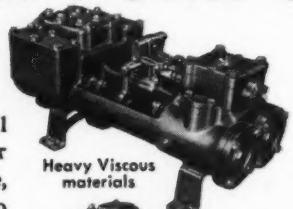
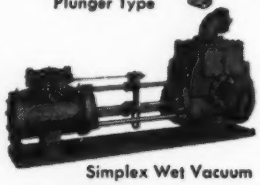
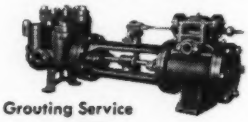
SOAP
SYRUPS
TAR
TURPENTINE
VACUUM SERVICE
VOLATILE LIQUIDS
WATER
WOOD PULP

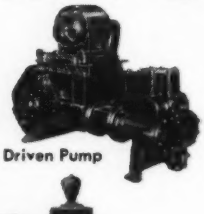

Heavy Viscous materials

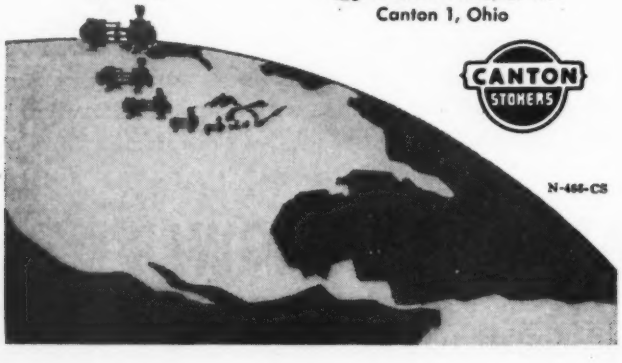
Boiler Feed . . . Plunger Type


Simplex Wet Vacuum

High Pressure Service


Grouting Service


Power Driven Pump



WAGENER PUMPS

WAGENER PUMP DIVISION
CANTON STOKER CORPORATION
425 Andrew Place, S. W.
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CANTON STOKERS

N-468-CS

Travelers Indemnity and Insurance Companies that the insurance industry will accept provisions of the bill. The industry is revising the policy contract to include not only the liability of the reactor operator, the designer, and the suppliers of components, but also the liability of any other person, or persons, without regard to whether they have any responsibility for operation, construction, or design. The insurance people have also receded from the stand that all licensees, with the exception of educational and charitable institutions operating research reactors, be required to furnish financial protection in an amount equal to the amount of liability insurance available. The bill as reported out requires that AEC make public the reports of the Reactor Safeguards Committee.

THE CITY OF CHICAGO has presented an invitation to UN Secretary-General Dag Hammarskjold to hold the Second International Conference on the Peaceful Uses of Atomic Energy in that city. The Conference is scheduled for the late summer of 1958. Brussels, Geneva, and Venice also have offered to act as the host city.

ITALY'S government has approved plans of Edisonvolta, of Milan, to purchase a 134,000-kw PWR from Westinghouse, and Societa Elettronucleare Italiana to purchase a 62,500-kw PWR from an unnamed supplier. Superheaters that may be incorporated in each reactor would raise the power to 240,000 kw and 102,000 kw respectively.

THE SOVIET UNION has announced that it has successfully operated its 10-Bev proton synchrotron at the Joint Nuclear Research Institute, near Moscow. The Russian machine is the largest accelerator now in operation.

ON MAY 1, AEC announced that the Sodium Reactor Experiment at Santa Susana, Calif., had gone critical on April 25. This is the first sodium-cooled thermal reactor to produce a sustained nuclear chain reaction. During initial start-up tests it operated at a power level of about one kilowatt of heat. No electricity was generated. Design capacity is 20,000 kw of heat. Heat produced will be purchased by Southern California Edison Co. to

Complete design Versatility with standard components

windows

Specify any size or type your design requires. Glass can be clear or patterned, and single or double glazed. Sash can be either fixed or operating in awning, projected, pivoted and hopper types or Robertson's new V-Window (hinged for inside cleaning).

verticals

The verticals as well as all trim can be fabricated from a variety of materials to provide contrast with the spandrels. The vertical members can be fabricated in a number of cross-sections to suit your design requirement.

spandrels

Here again, an infinite number of design and size selections are possible. The V-Panels can have a wide variety of surface patterns and be fabricated in aluminum, bronze, stainless steel, Galbestos or vitreous enameled aluminum or steel. Versatile Wall offers complete freedom of design.

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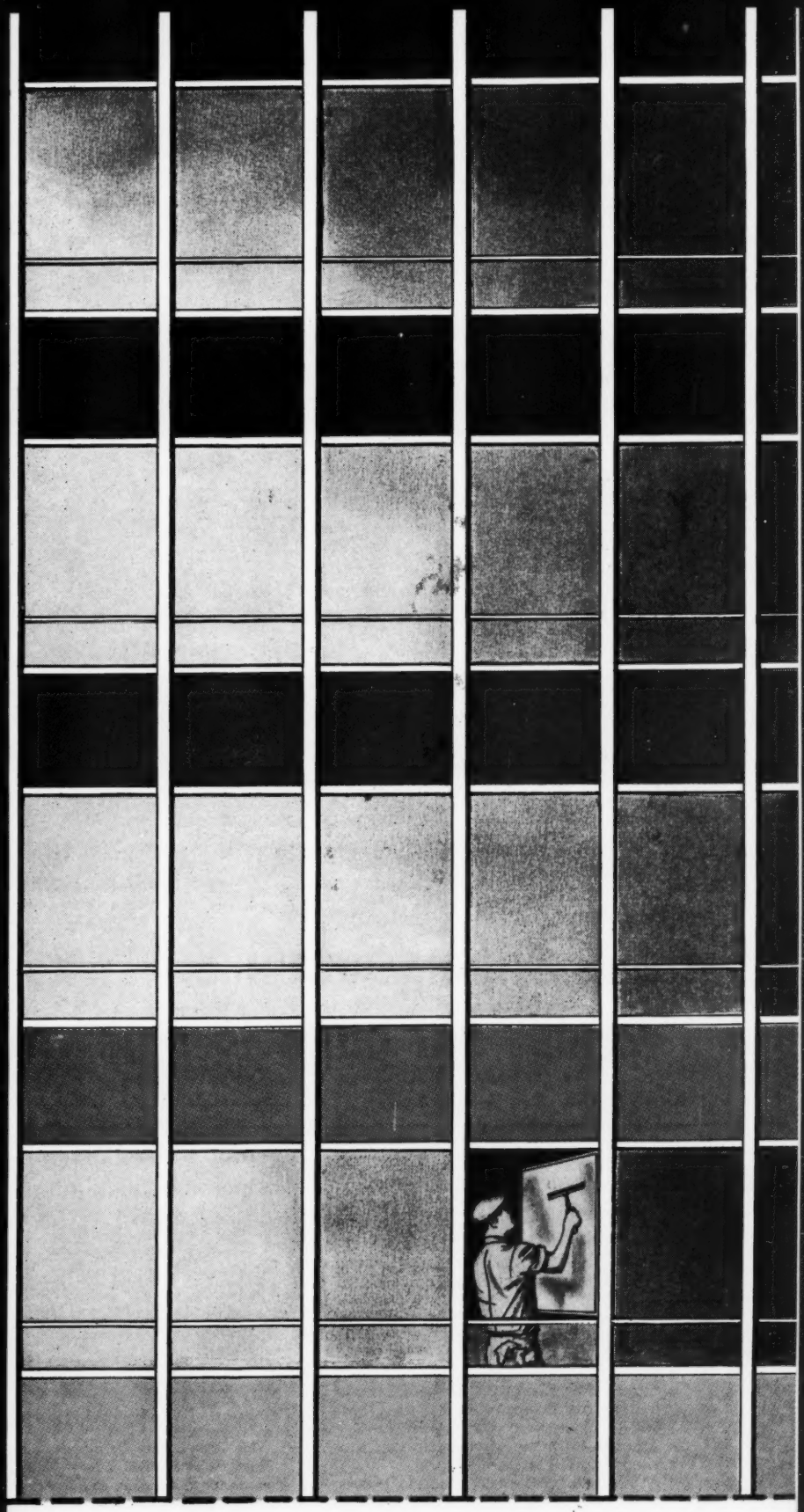

Robertson Versatile Wall

...a curtain wall as individual as your signature

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ELECTRIC PLANT NEWS

Photo Courtesy Oregon State Highway Commission

New striping machine "welds" hot paint to highway

Onan Electric Plant, mounted on vehicle, supplies current for 6,000-watt electric heater

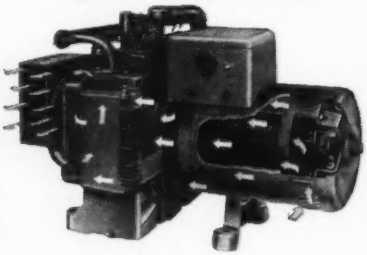
Highway striping has always been a headache for maintenance departments. The paint dries slowly, wears off too quickly, and it's expensive.

The vehicle shown above helps with all three of these problems by heating the paint to 160° before application. Hot paint dries within five minutes, it wears longer because it penetrates and bonds to the surface . . . and 30% less paint is required.

Current for the two 3,000-watt heating elements is supplied by an Onan 7,500-watt electric plant, powered by a smooth-running, two-cylinder, air-cooled Onan gasoline engine.

Wherever you need electric power . . . for lighting, motor-driven equipment, or heating . . . and highline power is not available . . . an Onan Electric Plant will do the job.

Onan Vacu-Flo cooling simplifies installations



With Onan's Vacu-Flo system, air is drawn, (rather than blown) through generator and engine, and discharged through a duct to the outside. An Onan air-cooled plant with Vacu-Flo can be installed in a small compartment within a truck or trailer.

A. C. Models: 500 to 75,000 watts. Also D. C. and Battery Charging units

Write for literature on the size and type electric plant you need.

D. W. ONAN & SONS INC.

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ELECTRIC PLANTS • AIR-COOLED ENGINES • GENERATORS • KAB KOOLER

generate about 6500 kw of electricity on an experimental basis. The SRE is the second reactor under AEC's original five-year plan to go critical, the first having been the Argonne EBWR.

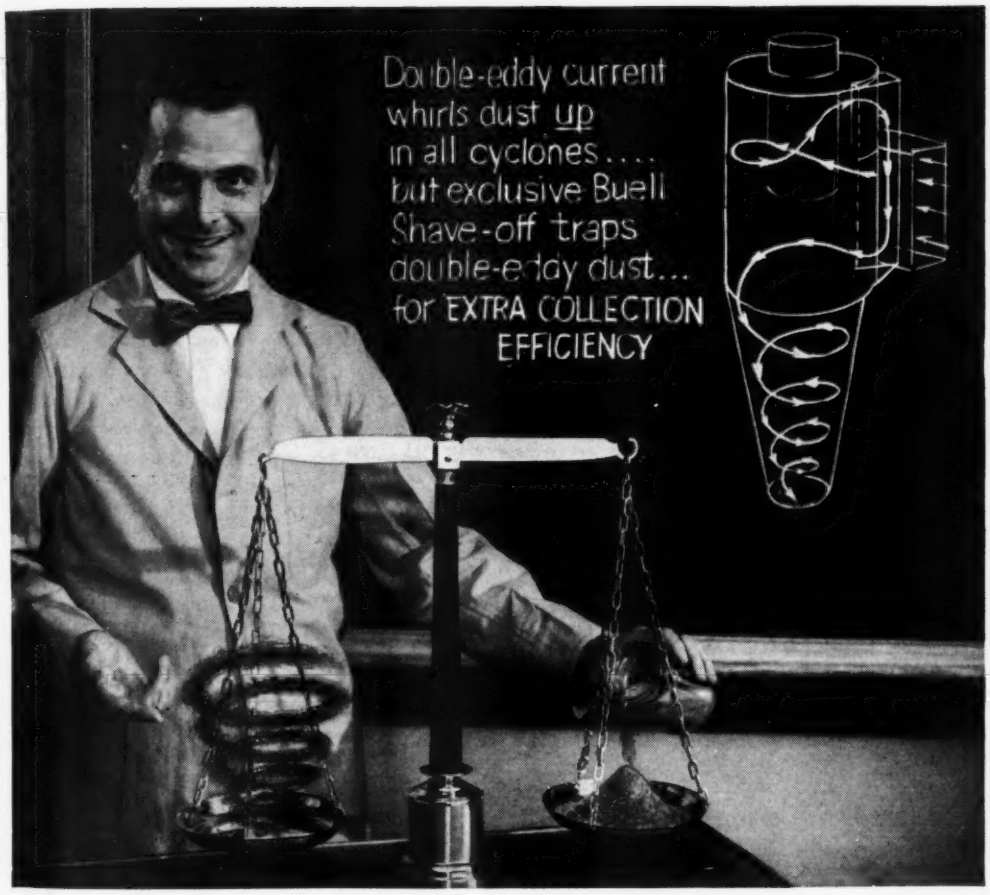
A NEW DEVICE for making nuclear reactors inherently safe has been developed by Lyle Borst, Chairman of New York University's physics department, and co-workers. Called a "convergatron," the device is a neutron amplifier in which the flow of neutrons is magnified in a manner analogous to magnifying the flow of electrons in a vacuum tube or transistor. Borst claims that use of the convergatron in conjunction with a nuclear power plant would guarantee safe operation of the plant, since it would permit use of a sub-critical mass of uranium fuel, making an unscheduled reactivity increase impossible. The fission chain reaction in the nuclear power plant could be controlled in normal operation by insertion and removal of the convergatron's neutron source.

FRANCE'S G-1 plutonium-power reactor, at Marcoule, which went critical in January of 1956, is operating continuously at about 30,000 kw of heat, having reached its design rating of 40,000 hkw for brief periods. Problems still unsolved are a lower coefficient of heat transfer from the fuel to the coolant than expected, difficulties with the charging and discharging mechanism, difficulties with fuel rupture detection equipment, and graphite expansion at relatively low operating temperatures.

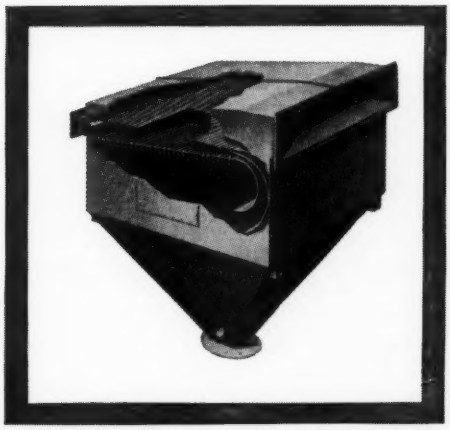
AEC has established a program to provide specialized work experience at AEC facilities for scientific and engineering employees of private firms and institutions engaging in the pursuit of peaceful applications of atomic energy. The applicant must be adequately qualified and must be unable to secure the same work experience elsewhere. For further information write to the Director of the Division of Civilian Application, Atomic Energy Comm., Washington 25, D. C.

REPRESENTATIVES of 80 nations have signed the International Atomic Energy Agency statute which means that the Agency will be a reality as soon as at least 18 of these nations ratify the statute. Six have

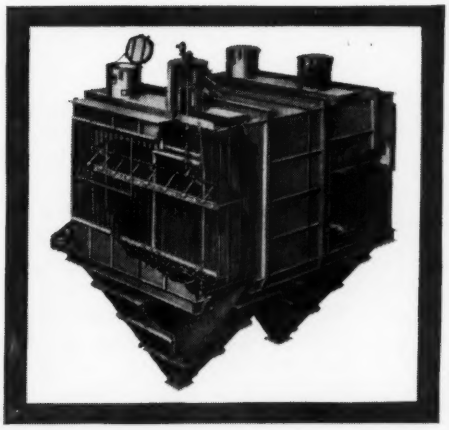
How Buell's Shave-off tips the scales for Extra Dust Collection Efficiency



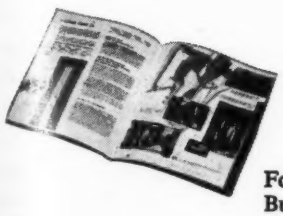
Side entry of dust-laden gases through Buell-designed manifolds minimizes turbulence, raises efficiency even higher in Buell cyclones. Large-diameter design eliminates clogging and bridging. Heavy plate construction assures years and years of extra service life without repair or replacement.



Buell's Low Resistance Fly Ash Collector combines top efficiency with low draft loss, for either natural or mechanical draft installations. Ideal for boilers from 100 to 2000 BHP.



SF Electric Precipitator, a Buell exclusive, also delivers *extra efficiency* due to unique Spiralectrodes and Continuous Cycle Rapping of collecting electrodes.



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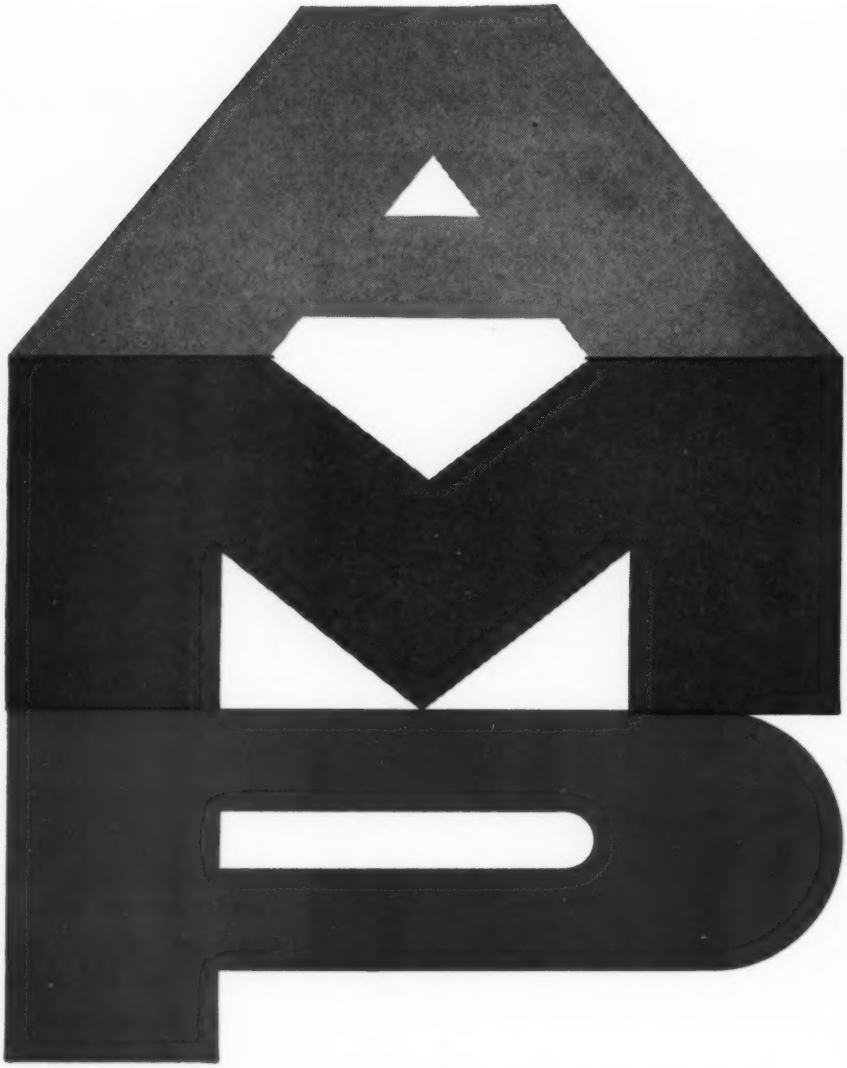

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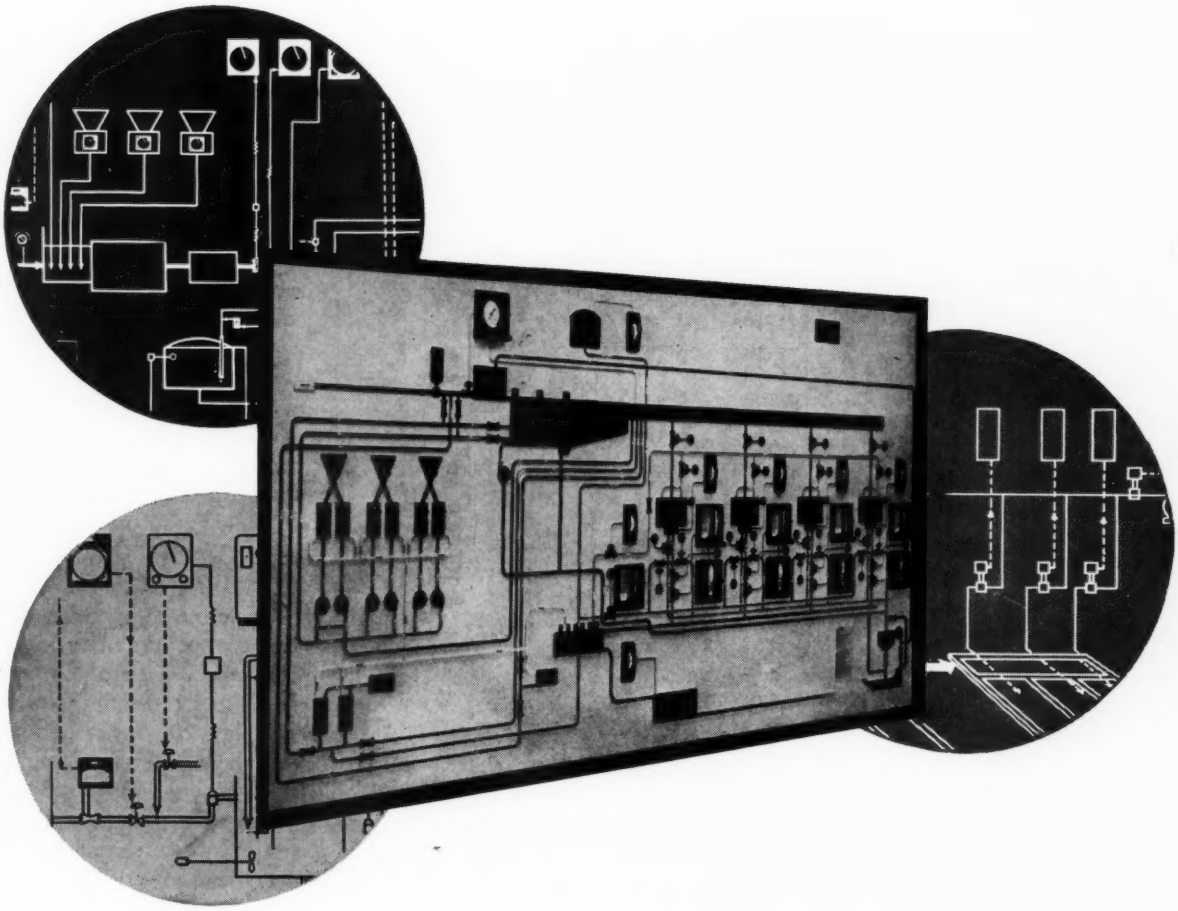
done so to date: the Soviet Union, Byelorussia, Egypt, Guatemala, Rumania, and Switzerland. In the U.S., President Eisenhower has referred the statute to the Senate for ratification. Public hearings by the Senate Foreign Relations Committee started in May.

FIRST of the "Project Size-Up" studies being conducted by American Radiator & Standard Sanitary Corp. for AEC compares operating economics of the Calder Hall and pressurized water power reactor types, in Britain, the U.S., and Japan. Conclusion is that power costs from the two types would be almost the same in the U.S. In Britain, because of lower construction costs and lower capital charges for both designs, the Calder Hall type would have a definite advantage over the PWR. Estimated figures are: in the U.S., 17.9 mills for Calder Hall and 19.6 mills for PWR; in the U.K., 8.0 mills for Calder Hall and 13.1 mills for PWR. In Japan, Calder Hall would cost 21.0 mills as against 21.8 mills for PWR. The studies are for the purpose of exploring the merits of various power reactor designs from the technical and economic standpoints.

THE CALDER HALL station gave less trouble in starting than a conventional power station or a normal chemical plant, according to Sir John Cockcroft, of Britain's Harwell establishment. Since the official opening in October, the station has operated for 90 percent of the time. Output has proved to be smooth and flexible, and it is possible to reduce electrical output from full load to 5 or 10 percent and back to 100 percent of load within half an hour.

NUCLEAR DEVELOPMENT CORP. of America has the AEC contract for research, development, and preliminary design work necessary to demonstrate feasibility of the liquid sodium cooled, heavy water moderated reactor system for the proposed Chugach Electric Association NDA facility for Anchorage, Alaska.

A NEW CONSULTING and research company, Texas Nuclear Corp., has been established in Austin, Texas, with Dr. Norman A. Bostrom as its president. Formed by a group of physicists experienced in the use of Van de Graaff machines, the firm will provide such services as analysis of com-



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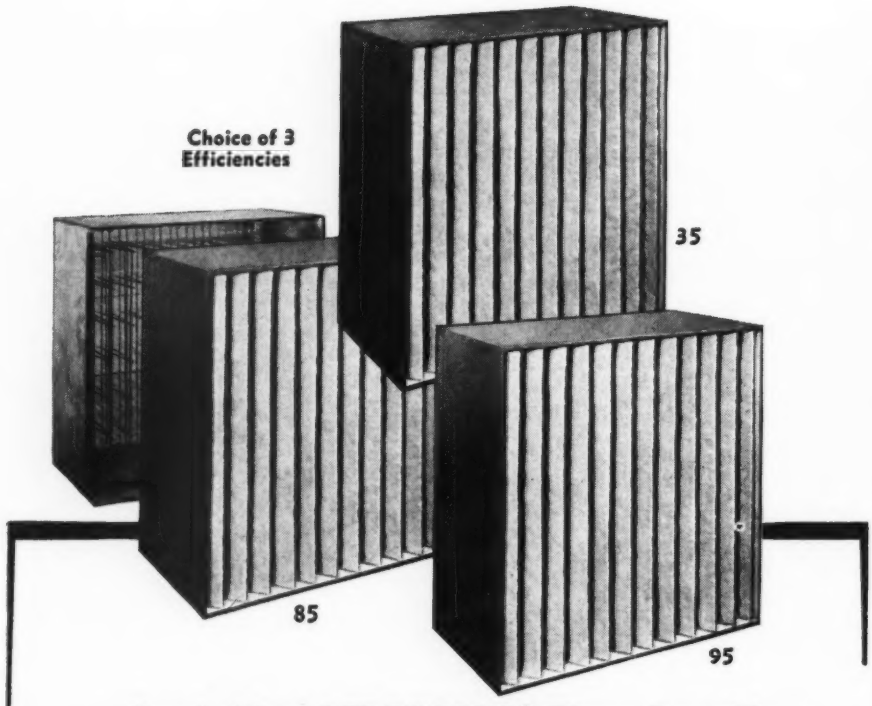

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pounds by nuclear methods, neutron activated cross-section studies, investigation of radiation damages, study of damage by electrons, electron sterilization, and well-logging research.

THE FRENCH GOVERNMENT has approved plans to build at least 850,000 kw of nuclear electrical capacity by 1965, and is considering increasing this goal, in the light of Euratom plans, to 2.5 million kw by 1965, and 4 million kw by 1967. A request has been sent to the French Parliament for about $1 billion for the second five-year atomic energy program. This includes about $69 million for a U-235 isotope separation plant.

THE AUSTRALIAN $12 million nuclear research establishment under construction near Sydney, which includes a Dido-type heavy water research and testing reactor being supplied by the British firm of Head Wrightson, will be completed early in 1958. Mount Isa Mines Ltd. has inquired of the Australian AEC concerning the advisability of building a 60,000-kw power plant at its mining installation in Queensland.

THE GOVERNMENTS of Denmark, Finland, Iceland, Norway, and Sweden have approved the recommendation of the Nordic Council to establish a joint atomic research institute at Copenhagen.

HIGH POWER ELECTRON linear accelerators have been put into commercial production at the Walnut Creek, Calif., plant of Applied Radiation Corp. The accelerators are used for processing foods, drugs, and chemicals, and for various types of nuclear research work. ▲▲

Expert Witness Reprint

Robin Beach's five articles on "The Engineer as an Expert Witness" are available in a 16-page reprint for $1.00. Please write to: Reader Service Dept., CONSULTING ENGINEER 227 Wayne St., St. Joseph, Mich.

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26,000 sq. feet without a single interior column!

CROWN HALL, at Illinois Institute of Technology, marks a milestone in the use of Structural Steel—a classic example of strength, economy, and honest, simple beauty.

The main floor of Crown Hall is a single room, 220 ft. long, 120 ft. wide, and 19½ ft. high. Yet, in this immense room there is not one structural column.

The vast roof is suspended from 6′-deep plate girders, which project out of the building as an exterior skeleton. These girders were shop-fabricated, and each was delivered to the building site in two 60-ft. sections. There, they were spliced and hoisted into place. Purlins are hung beneath the roofing.

This huge, open hall, which could be used for virtually anything from a factory to a theatre, was built at a cost of $13.71 per sq. ft.

Strength . . . economy . . . versatility . . . simple, vigorous beauty—these are the qualities offered by Structural Steel; qualities proved time and again in structures that range from mighty, bustling skyscrapers to serene, single-story panoramas of steel and glass like Crown Hall.

Structural Steel is easily the most economical of load-carrying materials—and the strongest. It will take more abuse than other structural materials, effectively resisting tension, torsion, shear and compression. Enclosed in buildings, it lasts indefinitely, needing no maintenance. Structural Steel may be welded, riveted, or bolted, and can be erected in any weather. Since steel members are fabricated indoors, weather cannot affect the quality of workmanship.

◀ **CROWN HALL** houses the Dept. of Agriculture, Institute of Design and Planning Dept. The entrance terrace is a gathering place for students between classes. The basement houses shops and classrooms.

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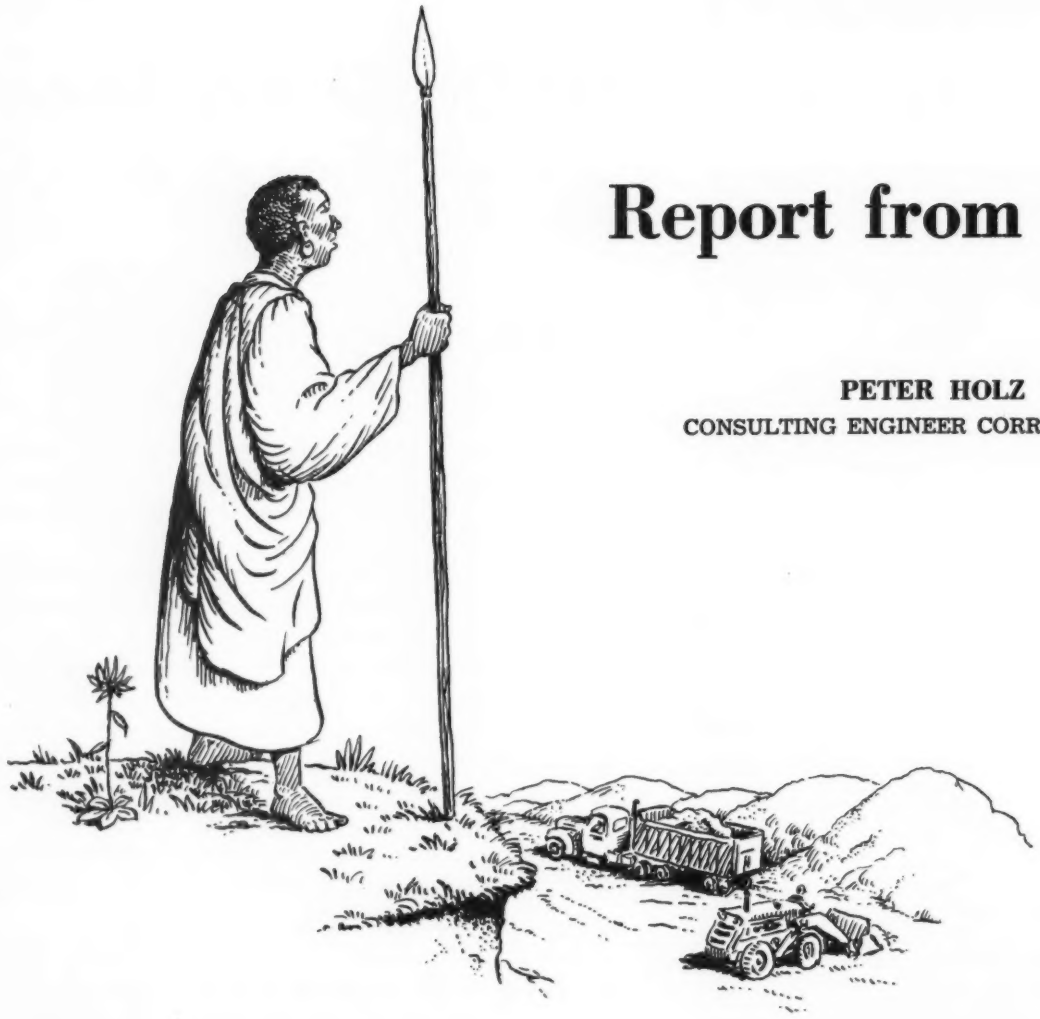

Report from Africa

PETER HOLZ
CONSULTING ENGINEER CORRESPONDENT

IN THE LAST TWELVE YEARS, since the end of world war II, a great number of Americans have come here to have a look at the Union of South Africa. Some have come as sightseers, interested in the country's animal and native life, others have come on business visits. All of them go away with the impression that South Africa is a vast country with tremendous industrial possibilities.

Mr. Willard S. Irle, a New York stockbroker who visited South Africa some weeks ago, spoke for many Americans when he said that if he were thirty years younger he would "go into it himself with big investments."

American capital has certainly discovered South Africa, and U.S. businesses have already poured $250 million into investments in the Union — car assembly plants, chemical industries, food processing projects, and scores of other factories whose thousands of products are in everyday use in the cities and remote corners of this country. Americans regard the Union as an "African beachhead", and their investments, often paying 10 percent dividends, are regarded as forerunners of even larger investments and more participation in the prosperity of one of the fastest developing countries of the world.

The great industrial development, which I discussed in CONSULTING ENGINEER, last year, is continuing. Consulting engineers are as busy as ever, and there is no indication that the number of projects they are handling will slacken off.

Take the work they are doing for municipalities — many small towns are expanding rapidly and have to extend their power plants, water works, and sewerage disposal schemes. Every one of these, and there are hundreds, employ a consulting engineer to design the project. Municipalities then call for bids from contractors, and quotations received are handed to the consultant, with whom the final choice of the most suitable bid rests.

Many American electrical and mechanical equipment manufacturers are locally represented. Their prices and terms of delivery go to consultants, together with those of English and continental manufacturers, who also have representatives in the Union of South Africa.

Although no consulting engineers in private practice are concerned with the Unions tremendous uranium production schemes, the engineers employed by South Africa's large mining companies are fully occupied in designing and supervising erection of new plants of which many are already in full production. As these mining companies have also gold, chrome, asbestos, copper, manganese, and

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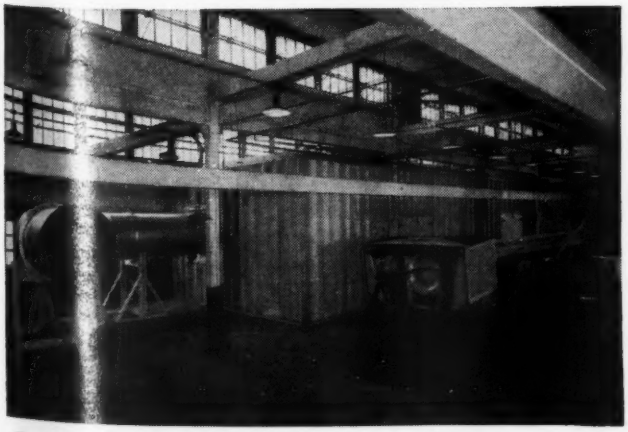
This data is entirely new. Nothing like it has ever before been available to the industry. The book is a result of noise control research recently completed by the acoustics staff of the Armour Research Foundation of Illinois Institute of Technology.

DeBothezat Centrifugal Roof Ventilator undergoing standard noise source calibration tests at Armour Research Foundation's acoustical laboratories.



Exterior view air outlet end of DeBothezat noise evaluation reverberation test rooms. Mock-up engine cooling test equipment in the foreground.

To supplement the research performed at Armour Research Foundation, which was sponsored by the DeBothezat Fans Division, DeBothezat has constructed its own noise-evaluation laboratories. These include reverberation rooms designed and calibrated for DeBothezat by Armour.

The entire noise evaluation project was sponsored by DeBothezat as a contribution to industry. It was accomplished at a cost of over $20,000 including the research at Armour and the facilities installed in DeBothezat's laboratories.

DeBothezat's facilities are now being used (1) to *obtain* accurate sound-output data on fan units, (2) to *develop* new fans with lower noise levels, and (3) to allow *publishing* of reliable sound-output data. In fact, DeBothezat fans are now rated for noise on both the inlet and outlet sides. These ratings are expressed in decibels and give the average sound pressure levels in each of 8 octave bands of frequencies, measured separately. This information is available on *all* DeBothezat fan units. They are the only fan units in the industry so rated.

The helpful 50-page book "Controlling Ventilation Noises," is available for just $2.00 prepaid to help defray costs of printing and handling. With it, anyone can predict and reduce ventilating fan noise in every installation. Request your copy on your business letterhead and attach check or two one-dollar bills.

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platinum mines, one can appreciate the amount of work on hand for these employee engineers. If the load increases, private consulting firms may be called on for help on this work.

Considerable thought has also been given by the South African Atomic Energy Board to new uranium markets and the ensuring of the continuation of existing markets — in view of the fact that contracts with the U.S.A. and Great Britain for the supply of uranium will expire in a few years time.

Atomic Power

A commission to investigate the application of atomic power in South Africa has also been appointed. The possibility of erecting an atomic power station in the Cape Province, an area far removed from sources of cheap coal, is already under investigation and should prove an interesting and lucrative proposition to a number of local and overseas consultants. It is unlikely that an atomic power station will be erected in Johannesburg, the Union's largest industrial complex, in view of the closeness of vast supplies of inexpensive coal.

The manufacture of heavy water in South Africa has been given serious consideration lately. The newly completed South African Oil-from-Coal plant, in which the American engineer-constructor firm of M. W. Kellogg was involved, is now in a position to make available a number of chemicals for the production of heavy water. This would be a $6 to $9 million industry at current prices.

Central Africa

To the north of the Union, in the Central African Federation, the large European firms of engineering consultants, Sir Alexander Gibb & Partners, Coyne & Bellier, and Sogei, are pressing on with the Kariba Project, which, when completed, promises to be the world's largest hydroelectric scheme.

Recent floods of the Zambesi River, on which the dam will be situated, seriously endangered the beginnings of this vast engineering scheme. The swollen river, carrying dead animals and huge trunks of trees with it, raced 6 feet above the 50-foot high coffer dam, which has been constructed by Italian contractors in the narrow Kariba Gorge. The project passed its test — and the floods were the worst in recorded histroy of the area.

Fortunately, the water did not rise high enough to sweep away a vital road bridge which had been constructed to join the north and south bank of the projected dam. This bridge is used not only for the conveyance of heavy items of equipment from one side of the gorge to the other but is

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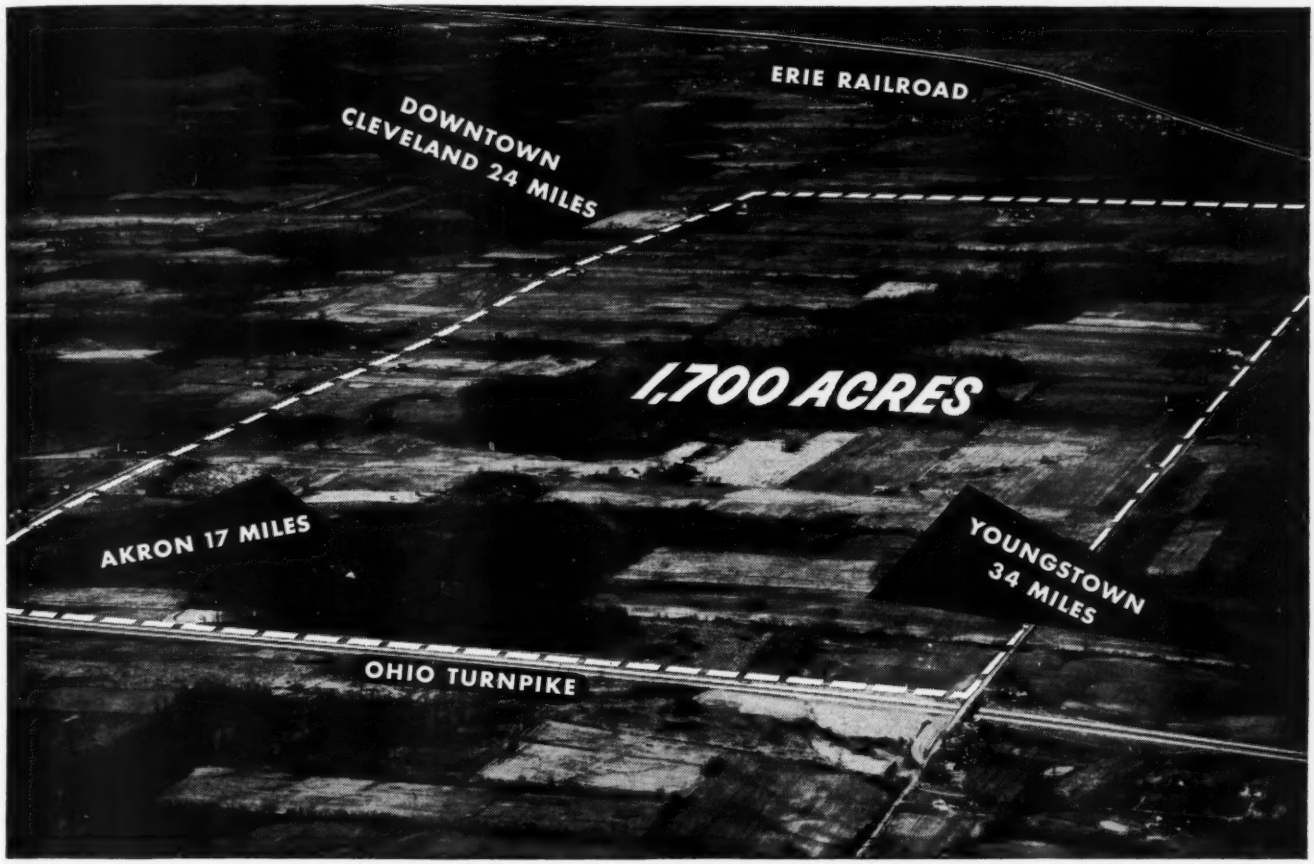

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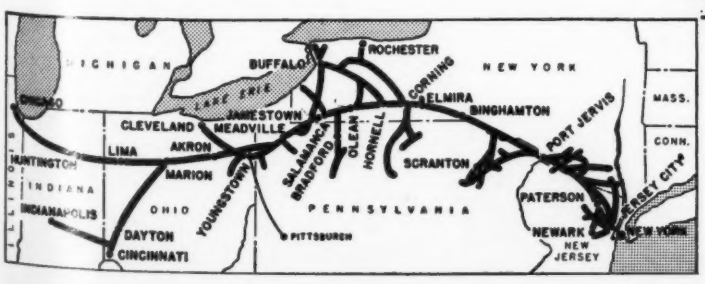

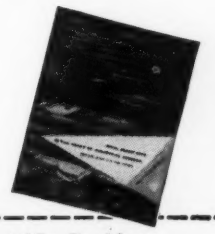

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also used as a gantry for the construction of a rockfill dam; an essential stage in construction.

Contractors, warned beforehand of the coming flood, braced the bridge with heavy cables to either side of the river and piled 100 tons of steel girders on it to give it added stability if the river rose high enough. Special masses were said by Italian workers at the site while the Zambesi waters rose at the rate of two inches per hour.

Despite the flood, it is thought that the Kariba Project will be finished on schedule and within estimated costs. The results of structural tests carried out in Paris are at present being examined, and a full report is in the course of preparation. There is every indication that the pure arch design of the dam, which is to be of mass concrete, is entirely satisfactory.

Behind the completed dam, the world's largest man made lake will have a shore line of some 800 miles. A huge supply of water is required, for in this area there are sometimes dry spells for many months — sometimes even years of drought. When the Kariba hydroelectric scheme is completed, some time in the nineteen sixties, the tremendous copper mining industry of the territory will depend almost completely on power from Kariba. Thus, enough water must be stored to keep the turbines running, no matter what.

Ghana — The Gold Coast

Looking further north to the newly created black empire of Ghana, formerly known as the Gold Coast, we see a British firm of consulting engineers, Sir William Halcrow and Partners, who are investigating the so-called Volta River Project, for the production of aluminum. This project, envisaging the use of hydroelectric power for the production of aluminum from the country's deposits of bauxite, was the subject of a Government White Paper in 1952. In the following year, the parties concerned — the Gold Coast and British Governments and British and Canadian aluminum interests — set up a Preparatory Commission to make a thorough investigation of the scheme. The report of the Commission, published last year, said that the project was technically sound and could be constructed and operated successfully. The estimate of the full cost, however, has risen since then from $432 million to $690 million. A Government statement has since said that all parties had agreed on a breathing spell in which to consider their respective positions in the light of the cost increase.

Primary object of the Volta River Project would be the production of about 210,000 tons of aluminum annually. To achieve

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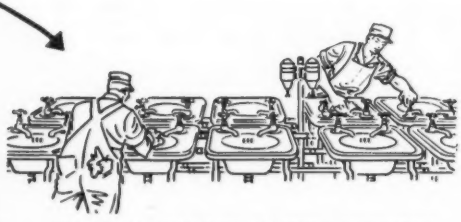

Eight wash basins have 24 piping connections —hot and cold water and drain. The 8 to 10 person Bradley has but *three* connections, and one sprayhead in place of 16 to 20 bothersome faucets.

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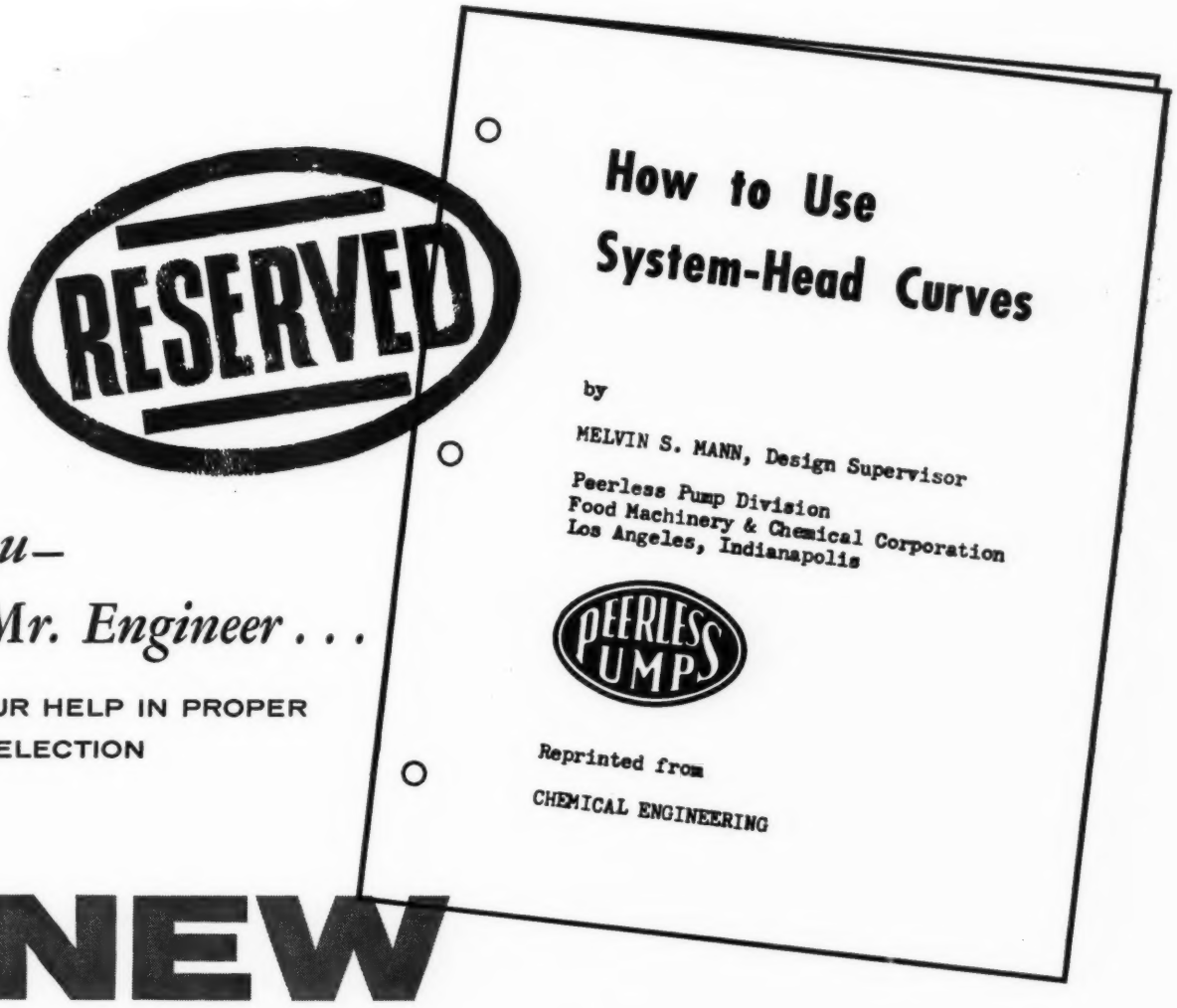

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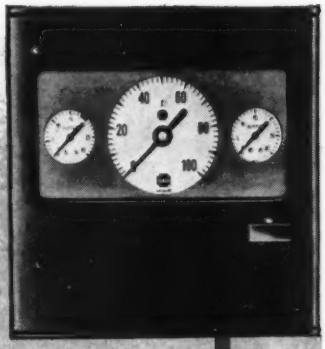

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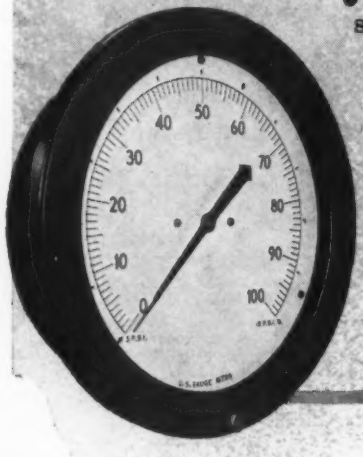

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this output bauxite mines would have to be developed, a dam and power station would have to be constructed at Ajena, an aluminum smelter would have to be built, and new railway links between mines and smelters and coast would have to be laid.

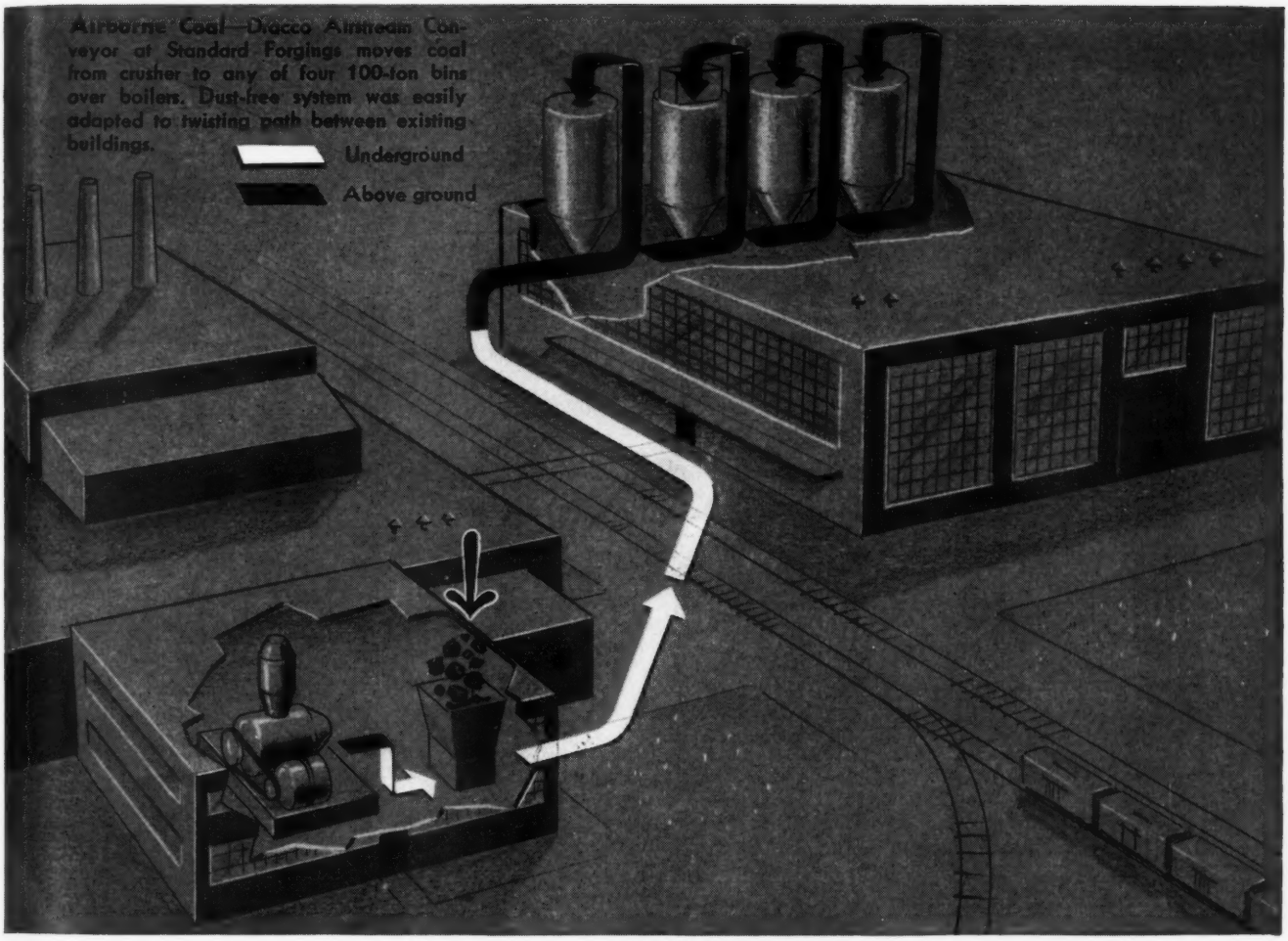
The Commission believes that the human factor will play a major part in the scheme and would possibly decide the success or failure of the whole project, for there are many problems associated with the development and maintenance of stable and efficient labor forces for long periods in a tropical area such as that in which Ghana is situated.

In Ethiopia

Directly to the east of Gahna, on the other side of the continent, is the Kingdom of Ethiopia, a country well known to the western world because of Mussolini's interest in it during the 30's as a possible colonial expansion area for Fascist Italy. Ethiopia has never been an industrially active country, but since the war, with Haile Selassie back on his throne in Addis Ababa, there has been an effort made to arouse the nation from its long period of dormancy.

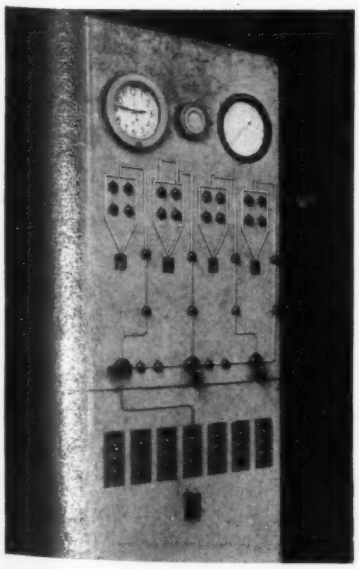
Need Outside Help

The government of Ethiopia is well aware that the nation is dependent on outside help for technical skills. The government in exile employed a group of consultants to prepare a development plan for the nation even before the war ended. Then, as soon as conditions made it possible, negotiations were begun for World Bank loans. In the opinion of the Bank, Ethiopia's greatest needs was for a modern highway system, and a loan of $5 million was made in September 1950. Using this money, a number of roads were repaired and three important arteries leading from Addis Ababa into the surrounding country were put in good shape. An autonomous Imperial Highway Authority was established to see to it that a good



Airborne Coal—Dracco Airstream Conveyor at Standard Forgings moves coal from crusher to any of four 100-ton bins over boilers. Dust-free system was easily adapted to twisting path between existing buildings.

conveying coal by *Airstream* cuts first cost 60%, saves $35,000 per year



Control Station—One man operates complete Dracco coal handling system from graphic control panel. Lights show flow path, switches permit remote control.

In a recent modernization program, Standard Forgings Corp., East Chicago (Ind.) installed a Dracco Airstream Conveyor to handle coal from crushers to boilers. This move has paid off in a big way—first cost was 60% less than an all-mechanical conveyor . . . savings in coal and other costs have piled up at the rate of over $35,000 per year!

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With an automatic Dracco Airstream Conveyor, coal is transported at 30 tons per hour through a dust-tight system. One operator, aided by bin-level indicators and remote-controlled diverter gates, controls all handling from a central switch panel. There is no waste, loss or spillage of coal. System maintenance is practically zero.

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maintenance program was established and continued.

Since the building of those roads, the import of fuels for motor vehicles has more than doubled. Transportation rate costs have decreased by 20 to 30 percent. Competition from highway freight also has resulted in a reduction of rail rates on the country's only railroad which runs from Addis Ababa to French Somaliland.

In all of the highway construction program, the government made wide use of foreign experts, both from the United States and Europe. The government of that nation is most anxious to obtain technical help, and qualified engineers from all parts of the world will find their services in demand.

Foreign experts working in Ethiopia will be surprised to find that in many instances the Emperor, "The Conquering Lion of the Tribe of Judah, Elect of God" is the man who makes the final decisions. Consulting engineers are not accustomed to settling minor problems directly with an Emporer client.

Financially Sound

The World Bank has been pleased with the way Ethiopia has been able to make the required repayments on the loan, and also contribute a great deal of government money directly to the road building and maintenance program. However, this road work has only begun. Even the newly repaired roads have traffic averages of no more than approximately 100 vehicles a day. But this traffic is increasing, and there is already need for further improvements.

Since only about twenty Ethiopians a year are educated as engineers, and since there are only two engineers now working for the Highway Authority, it is plain that Ethiopia stands in needs of foreign assistance. The U.S. Bureau of Public Roads has a contract to help through 1960, but even more technical assistance could be used. There are a number of airport

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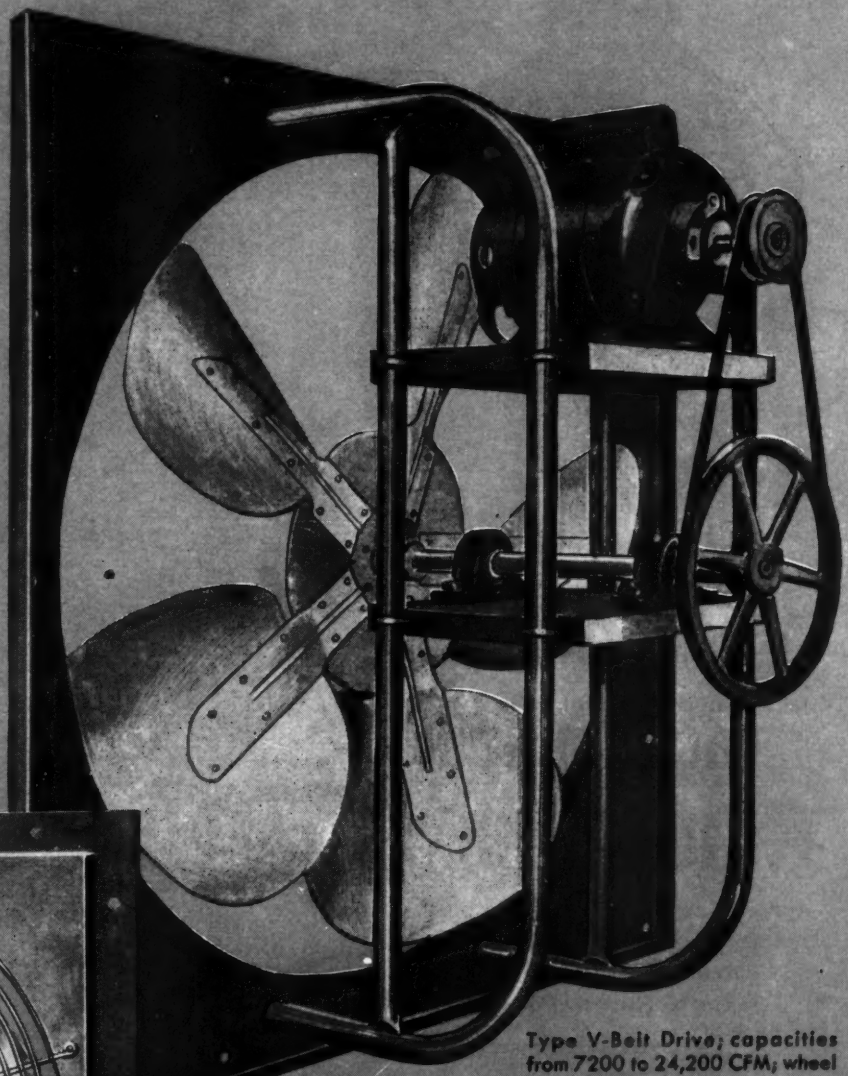

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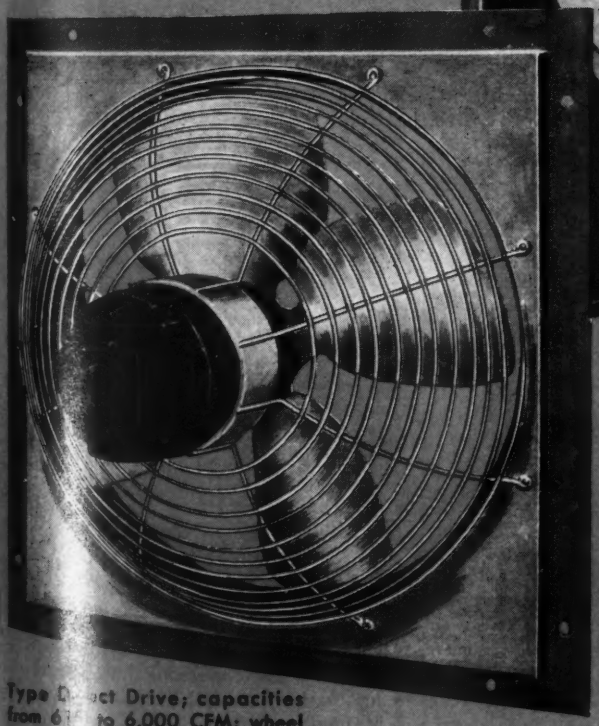

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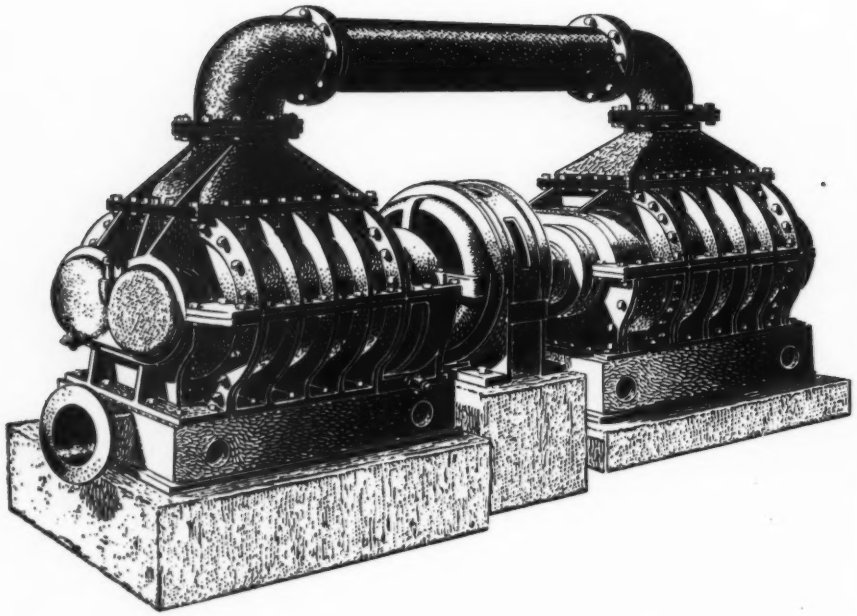
projects, and it is understood that the principal one at Addis Ababa is now being handled by an American consulting firm. Then, there is a wide open field for industrial development, and U.S. engineers could certainly get in on this.

The government is again negotiating with the World Bank, and substantial loans currently are being considered.

Catching Up

All over Africa, schemes involving consulting engineers are springing up like so many mushrooms. Admittedly not all of them are on the gigantic scale as those I have described, but they nevertheless offer lucrative and interesting work for the consultant, the contractor, the artisan, and the laborer. Africa is no longer the dark continent it used to be. Its 200 million Africans, guided by less than 5 million Europeans are rapidly catching up with the more developed areas of the world. ▲▲



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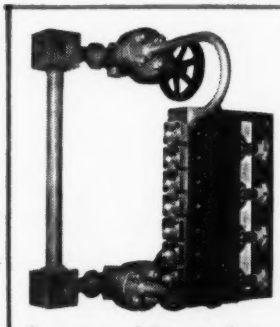

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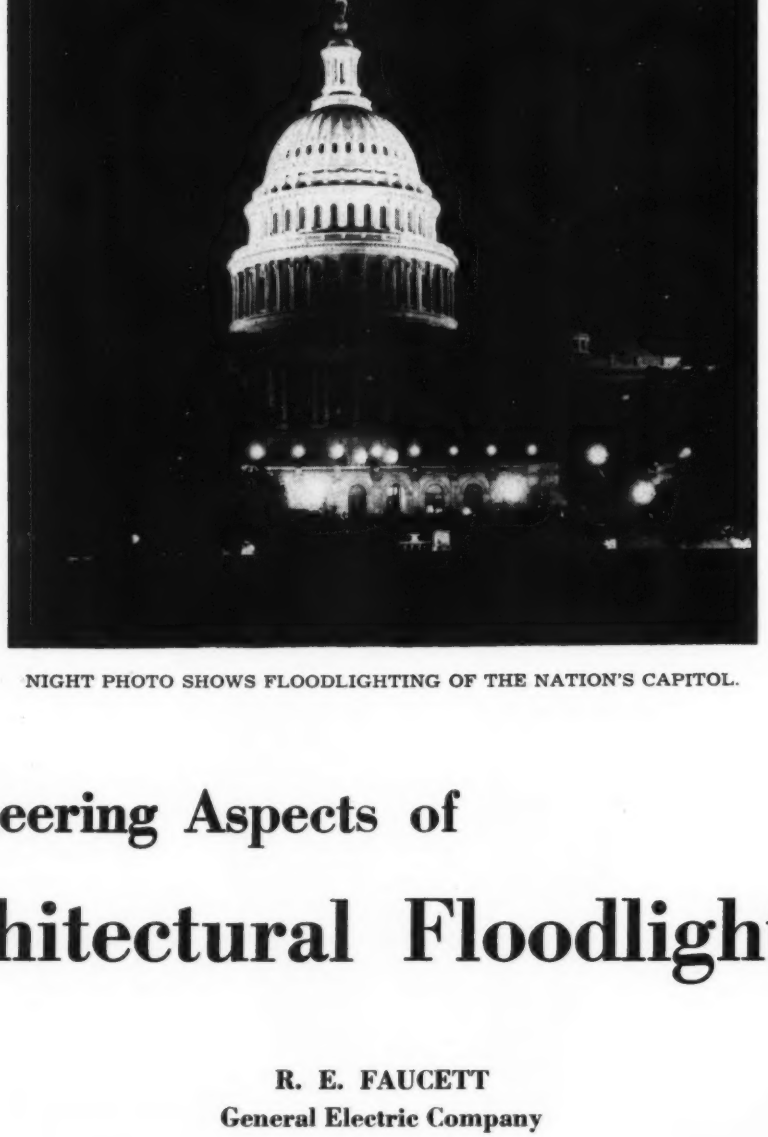

NIGHT PHOTO SHOWS FLOODLIGHTING OF THE NATION'S CAPITOL.

The Engineering Aspects of Architectural Floodlighting

R. E. FAUCETT
General Electric Company

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CONSULTING ENGINEERS will find that many small organizations as well as the larger ones are recognizing the benefits to be gained by decorative lighting of their buildings and property. Floodlighting a building promotes business by offering a subtle form of prestige. Property values tend to be increased, present tenants are impressed, and new tenants are attracted. Floodlighting also is a factor in attracting customers to retail stores; it is a dignified but dramatic method of advertising, which continually identifies and calls attention to a building and its occupants.

Floodlighting a community's public buildings, monuments, memorials, fountains, points of historic interest, and other civic attractions adds beauty and interest. Moreover, it fosters community pride.

More Than One Approach

There are probably as many good lighting schemes for a building as there are people available to provide ideas. There is perhaps no one way to design an outdoor lighting installation but rather there are many possibilities which could be equally spectacular, each producing a different effect. This is apparent when one realizes the vast array of lighting equipment available including incandescent, mercury, and fluorescent sources. When one considers the many effects possible by selection of different equipments or combinations of equipments, exact location for

mounting, aiming, and intensities (not to mention the use of color) it is apparent that floodlighting is as much an art as a science. Imagination and ability to visualize new ideas are very important assets when planning such an installation.

The general design procedure can be condensed to five steps:

¶ Determine effect desired.
¶ Determine location of lighting equipment.
¶ Determine design level of illumination.
¶ Determine equipment to be used.
¶ Check entire layout for adequate coverage and desired uniformity.

Each of these should be considered separately.

Effect Desired

A floodlighted structure should not have its form, beauty, or identity distorted by improper floodlighting design. Shadow effects need careful attention. Architects, of course, have a good idea of the appearance of their building in daylight and may consciously plan certain aspects with daylight shadows in mind. Floodlighting, usually done from low levels, frequently reverses or eliminates those shadows.

Since the effect to be achieved is primarily an artistic consideration, it is advisable to consult with the architect and owner of the building to get their ideas. Buildings are impressive because of such things as beauty of outline and harmony of proportions rather than because of size. In general, the desired effects can be achieved by the architect keeping in mind the following considerations — and they should be called to his attention.

¶ Surface brightness should produce proper perspectives when viewed from afar. Flat illumination which destroys depth and perspective is undesirable. By the same token, large brightness contrasts on adjacent areas should be avoided since bright areas appear closer and dark areas appear farther away to distant observers.

¶ Shadows should appear as natural as practical. If duplication of the shadows produced by the sun is not feasible, the shadows should present an interesting pattern and should not destroy the basic form and depth of the architecture.

¶ The texture and character of walls and other flat surfaces should be lighted by a sufficiently high level of illumination.

¶ A building should be integrated with — not suspended from — adjacent grounds, slopes, stairs, or plazas. This can be accomplished by illuminating sufficient surrounding area.

¶ There should be no objectionable glare in the field of vision of persons normally viewing the structure, and the equipment should be inconspicuously located.

¶ The observers' positions are important. For example, floodlighted upper floors of a building may not be very impressive in the streets although this could command attention from the suburbs or from the ridge of a nearby hill.

¶ An artist's conception of the final effect is very desirable to visually summarize the design goal.

Location of Equipment

Once the artistic aspects have been agreed upon, exterior floodlighting becomes primarily an engineering problem. First, it is necessary to consider the four possible locations of floodlighting equipment: on ornamental poles; on the ground; on the building itself; and on other nearby buildings.

The nation's Capitol building, is floodlighted from units mounted on ornamental standards as well as from banks of floodlights mounted on the roof. Units also can be effectively ground-mounted. If units are located on the ground, special care should be taken to avoid objectionable glare and they should be made as inconspicuous as possible during daylight hours. Shrubs and bushes have been used successfully to accomplish both purposes. When floodlights are mounted on a building they can be

TABLE 1 — RECOMMENDED FOOTCANDLE LEVELS FOR BUILDING EXTERIORS

Building Surfaces	Reflection Factors, %	Recommended Footcandle Level		
		A	B	C
White Terra Cotta Cream Terra Cotta Light Marble White Plaster	70-85	15	10	5
Light Gray Limestone Bedford Limestone Buff Limestone Smooth Buff-Face Brick Concrete	45-70	20	15	10
Briar-Hill Sandstone Smooth Gray Brick Medium Gray Limestone Common Tan Brick Dark Field Gray Brick	20-45	30	22	15
Common Red Brick Brownstone Stained Wood Shingle	10-20*	50	35	20

A — buildings and white ways; intensive street lighting; streets with many conflicting signs and light sources; lower portions of buildings falling under Class B locations.

B — medium-intensity white ways; secondary business streets with few conflicting signs, etc.

C — very little conflicting light, such as residential streets, parks, lighted highways, etc.

*Buildings or objects made of materials having a reflectance of less than about 20 percent usually cannot be floodlighted economically unless they have a large amount of high-reflectance trim.

TABLE 2 — APPROXIMATE FACTORS BY WHICH CLEAR BULB INCANDESCENT FILAMENT LAMP WATTAGE MUST BE MULTIPLIED TO COMPENSATE FOR THE ABSORPTION OF VARIOUS COLOR FILTERS

Desired effect relative to white light	*Approximate Multiplying Factor*			
	Amber	*Red*	*Green*	*Blue*
Equal footcandles of illumination	2	6	15	25
Equal advertising or decorative value	1.5	2	4	6

placed between cupolas near the roof edge or along one of the lower levels. Many buildings have conveniently located niches, ledges, and marquees which constitute part of the design. If these do not exist, it may be feasible to construct false cornices, balconies, or other special mountings to blend with the architecture and render the floodlights inconspicuous.

There is also the possibility of utilizing nearby buildings for mounting floodlights. However, improperly aimed or poorly shielded units mounted on nearby buildings may annoy occupants of those buildings. A change in the installation may be necessary if the ownership of the property changes, and the need for separate power metering is frequently a handicap.

Level of Illumination

Table 1, "Recommended Footcandle Levels for Building Exteriors," is based on information found in the *IES Lighting Handbook,* published by the Illuminating Engineering Society. The figures apply to white rather than colored light. If the addition of color is desired simply for artistic effect, it is not necessary to maintain the recommended footcandle levels shown in Table 1. However a greater wattage is required because of the filter absorption. For example, with an amber filter, it would take twice the wattage to give the same footcandle level, but only one and one-half times the wattage to give the same artistic effect. Table 2 will be of assistance in determining acceptable values. Table 2 obviously assumes certain transmittance values for various color filters. These assumptions are justifiable ones, but the engineer would want to check the transmittance of the specific color filter he proposes to use and make adjustments accordingly.

A blend of colors frequently can be used to produce a desired spectacular effort. A program of changing colors has been used to add animation to a display. This can be accomplished in various ways. Rotating color wheels, dimmers, or simple on-off controllers can be employed to program selected colored lights in the desired cycle.

In order to prevent possible annoyance to pedestrian or motor traffic, the lower portions of a building may be illuminated to somewhat lower levels if the building is located in a relatively crowded area. If it is desirable to present an appearance of uniform brightness over the surface of very tall structures, it will be necessary to provide higher illumination levels on the upper stories because of transmission losses in the atmosphere. It

LIGHTING LEVEL TAPERS OFF AT UPPER END OF EACH LEVEL TO ADD TO IMPRESSION OF BUILDING'S HEIGHT.

is recommended that the top portions be two to four times as bright as the lower areas in order to achieve apparent uniformity. This also accentuates the apparent height.

This technique was used on the Kansas City P&L building, and it is also apparent in the photograph that the upper portion of each setback is comparatively darker than the lower portion of the next higher setback. This is done so that the floodlighting would not destroy the form of the building by eliminating depth. This nonuniformity introduced into the design makes each setback appear in proper relationship to the adjacent setback.

Equipment to be Used

Probably the most important factor to be considered when choosing the proper floodlighting equipment is beam spread. Beam spread may be defined as the angle, measured in degrees, between points on a candlepower distribution curve which are 10 percent of maximum. Fig. 1 illustrates beam spread. In any given situation there exists an area to be lighted from a position a fixed distance away. This guides the choice of beam spreads because a large area to be lighted from a relatively short distance dictates the choice of wide beam equipment, whereas the same area lighted from a greater distance would call for relatively narrower beam equipment.

Four factors determine beam spread.

¶ Dimensions of the light source and reflector — as the ratio of light source dimension to reflector size increases, beam spread increases.

¶ Surface texture of the reflector — polished for narrow beams; etched for wide beams.

¶ Diffusing or refracting characteristics of the enclosing cover.

¶ Focal length of the reflector — whether it be spherical, elliptical, paraboloidal, cylindrical, or a combination of these plus others. In general, the shorter the focal length, the larger the beam spread. For example, for a paraboloidal reflector the first approximation of beam spread is given by the formula:

$$BS = 2 \tan^{-1} r \div f, \text{ where,}$$

BS = beam spread in degrees; r = radius of source; and f = focal length of reflector. Note also that this equation shows the effect of source size (r).

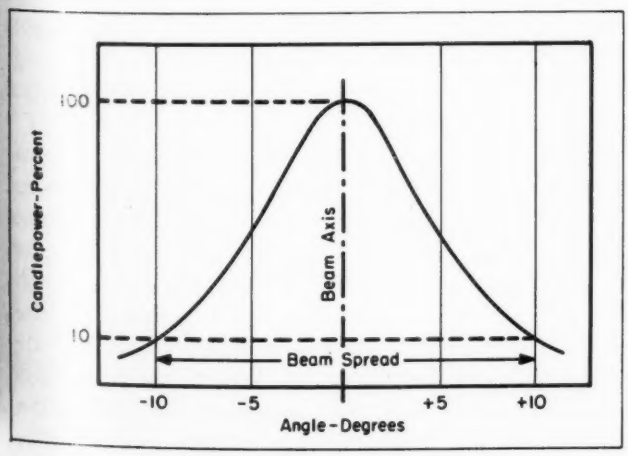


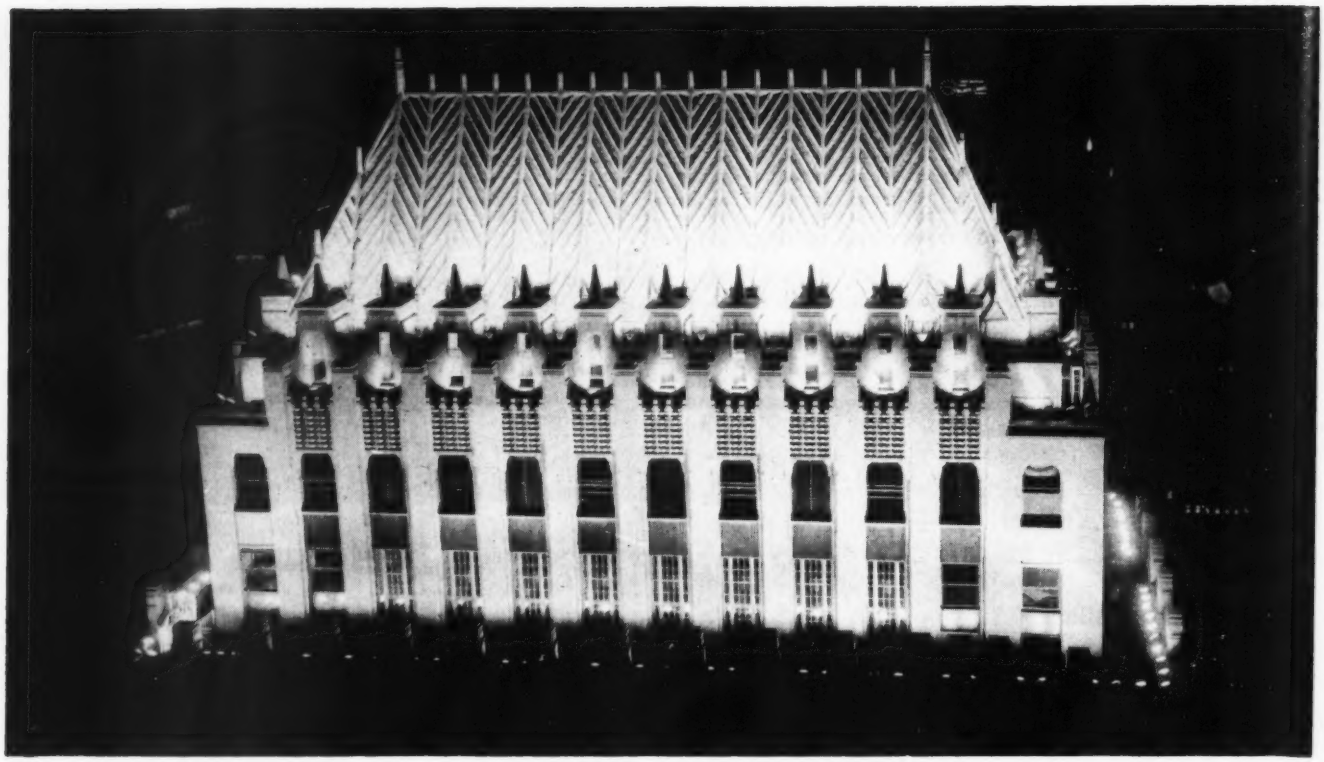
FIG. 1—CANDLEPOWER DISTRIBUTION OF A TYPICAL FLOODLIGHT HAVING BEAM SPREAD OF 20 DEGREES.

FLOODLIGHTS FOR THE UPPER LEVEL OF THIS TALL BUILDING ARE NEATLY PIPE-MOUNTED ON A SETBACK.

The conventional general service type incandescent lamp, placed inside a polished aluminum reflector (covered by a plain clear door glass), gives a beam spread of 25 degrees vertical and 25 degrees horizontal. By simply changing the reflecting surfaces from polished to that of etched, we obtain a spread of 66 degrees vertical and horizontal. If we substitute a lightly stippled door glass on the first floodlight we would obtain a beam spread of approximately 42 degrees in both directions. Going one step further, if we substitute a Fresnel prism refracting door glass on the polished-reflector floodlight we could obtain a nonsymmetrical beam pattern, of say 26 degrees vertical and 43 degrees horizontal. Thus, for any given floodlight mounting location from which any given area is illuminated, there should be an ideal floodlight with beam spread and intensity characteristics to provide optimum beam spread and uniformity. All of this applies equally to incandescent, fluorescent, mercury, or experimental lamps.

All reputable manufacturers of lighting equipment make available photometric information showing pertinent data for their equipment. These data provide the beam spread, efficiency, candlepower distribution, and quantity of light (lumens) in every part of the beam as well as other data on the lamp employed. With this information it is a relatively easy matter for the engineer to calculate an installation. The handy relationship "footcandles equal lumens per square foot" helps to find the proper type and required number of floodlights.

Keeping this relationship in mind, the number of floodlights required to achieve the desired il-



THE OVER-ALL EFFECT OF FLOODLIGHTING JUST THE TOP FEW FLOORS OF A TALL DOWNTOWN OFFICE BUILDING.

lumination level may be estimated by solving the following equation for N:

$$N = EA \div L(MF), \text{ where,}$$

N = the number of floodlights required
E = average level of illumination (footcandles)
A = area being illuminated (square feet)
L = lumens from floodlight that actually fall on the area to be illuminated (one lumen uniformly distributed over an area of one square foot produces an illumination level of one footcandle)
MF = maintenance factor — This compensates for reduced illumination as the installation becomes older. The loss of illumination in service is due to the combined effects of the gradual lowering of lamp output during its life and the losses due to collection of dust and dirt. A maintenance factor of 0.75 generally is accepted as a reasonable value for enclosed equipment and 0.65 for open reflectors.

Let us assume that it is required to illuminate, for advertising purposes, the upper third of a red brick industrial smokestack. The stack is 75-ft high and 20-ft in diameter so the area to be lighted is:

$$(75 \div 3)\ (20\ \pi) = 1575 \text{ sq ft}$$

Let us further assume that there is very little conflicting light in the environs and background to detract from the stack. Reference to Table 1 indicates that the recommended level of illumination is 20 footcandles.

Assuming this area is not extremely dirty, a maintenance factor of 0.75 can safely be applied, as enclosed floodlights are contemplated. Let us plot the projected area of the stack as seen from one of the locations where floodlights are to be mounted. This has been done on Fig. 2. By adding up the lumens intercepted by the projected area of our stack, we then have the total initial utilized lumens (L). Note that it is only necessary to add up the lumens in half of the area and then multiply this total by two as the beam is symmetrical. Only the projected area to be illuminated is plotted on Fig. 2,

ORNAMENTAL FIXTURES ATOP STREET-LIGHTING STANDARDS CONCEAL FLOODLIGHTS USED ON THIS BUILDING.

so, only the lumens included by this area should be totaled. If only a fraction of the lumens in one of the 4 x 4 degree zones is enclosed by the projected area, this fraction is estimated. For example, it appears that only ½ of the indicated lumens are utilized from the increment (128) centered at 10 degrees right H, 10 degrees up V. Therefore, only 64 lumens are counted as being utilized from this zone.

The sum of all utilized lumens enclosed by the projected area under consideration is approximately 16,040. Thus, the number of 1500-watt floodlights required to provide 20 footcandles will be:

$N = 20 \times 1575 \div 16{,}040 \times 0.75 = 2.62$ floodlights

This means we must have at least three units to provide an average of 20 maintained footcandles.

This number works out conveniently because we can obtain very good coverage by spacing the units around the stack at three locations, 120 degrees apart, all being approximately the same distance from the base.

It is obvious that if the above system were installed, the level of illumination halfway between units would be less than at the point where the unit is aimed. In this example the uniformity would be well within acceptable limits. However, if extremely good uniformity were required, additional floodlights would be necessary. The average level of illumination and power consumption would be increased if identical floodlights were added. If greater uniformity is required without increasing the power consumption, it is recommended that six units employing 750-watt lamps be installed, symmetrically located one every 60 degrees around the stack.

As a general rule, it is wiser to design a system with a small number of large filament lamps than with a large number of small lamps. This provides simpler installation, control, and maintenance. Another reason is that, in general, the larger the lamp, the higher the efficiency.

The 1500-watt floodlight sets a practical upper limit to size as larger floodlights are more difficult to conceal. Making the floodlights inconspicuous is important where their daytime exposure is architecturally objectionable.

Coverage and Uniformity

We usually are concerned with lighting vertical surfaces when dealing with architectural objects, yet horizontal nonuniformity (scalloped effects between floodlights) is seldom acceptable. The following rules will be helpful in determining correct floodlight locations to obtain good horizontal uniformity.

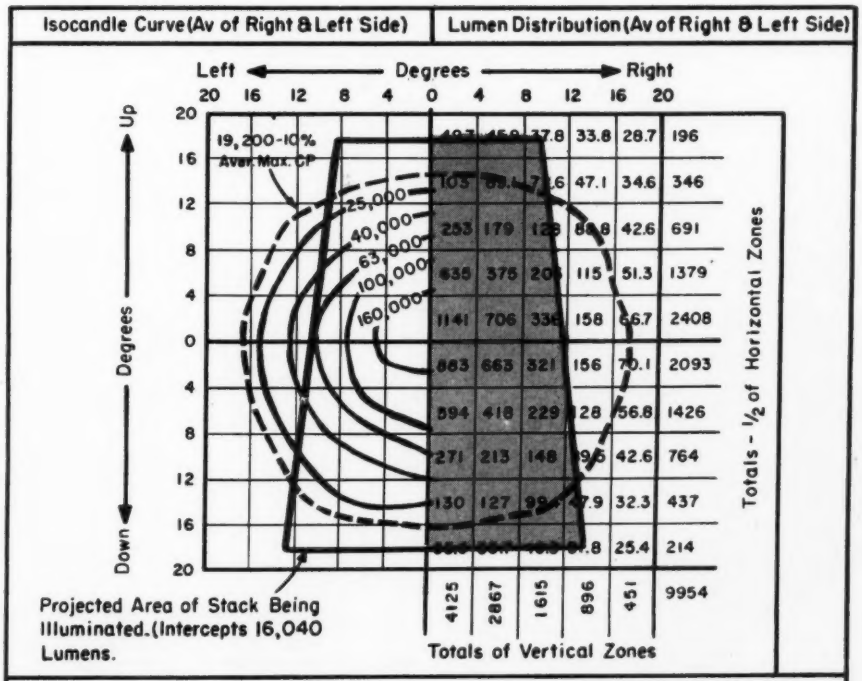
¶ Beams should overlap in such a way that any given area receives as much light from floodlights on either side as the one directly in front of it.

¶ Use the floodlight with the widest beam spread consistent with reasonable utilization.

¶ Use the largest lamp consistent with acceptable uniformity.

The proper aiming of floodlights is just as important as the selection of the equipment. Approximate aiming can be determined by careful scale drawings of beam overlaps, but the exact final aiming of floodlighting equipment must be adjusted in the field regardless of how carefully it was planned or how accurately it was laid out. If this final tune-up is not done, the results will not be satisfactory.

There is no reason why an engineer should hesitate to lay out a floodlighting system, especially with all the equipment data offered by most manufacturers. If the few simple rules presented here are followed, there will result an installation of which the consulting engineer, the architect, and the owner can be justly proud. ▲▲



Results Are Typical Only When All Test Conditions, Such as Light Center Position, Lamp Lumens, Etc., Are Reproduced

Watts	1500	Bulb	PS-52
Volts	120	Lamp Lumens	33,000
Filament Type	C-7A	Beam Lumens	17,500
Filament Height in mm	28.5	Beam Efficiency in Percent	53.0
Filament Width in mm	33.3 x 27	Beam Spread Horiz. -34°	Vert -30.5°
Light Center Length in Inches	9¾"	Average Max. Candlepower	192,000

FIG. 2—TYPICAL PHOTOMETRIC DATA ON NEMA TYPE 3, CLASS GP FLOODLIGHT.

Designing Thin Shell Structures

BOYD G. ANDERSON
Associate Partner, Ammann & Whitney

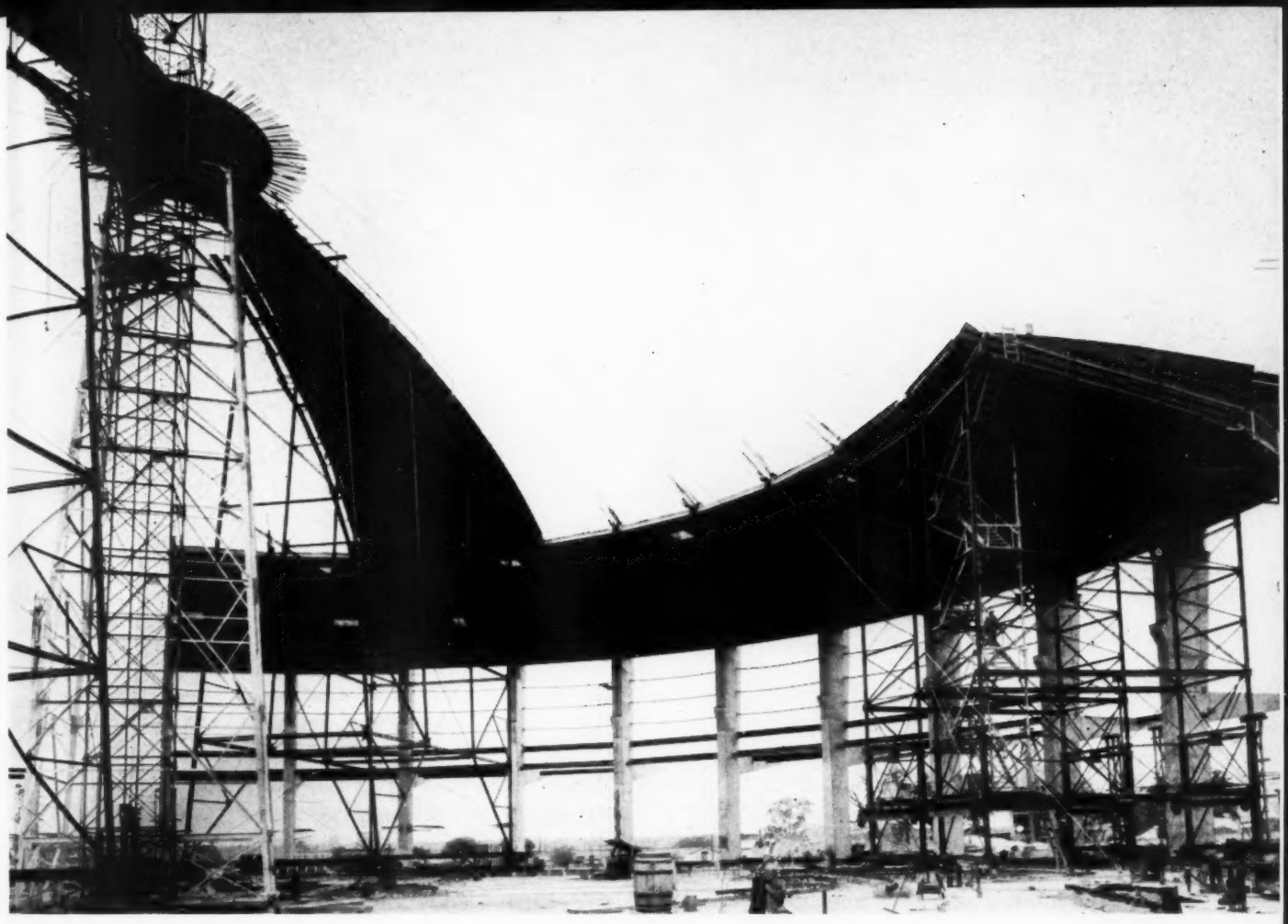
CE exclusive

THE NEED FOR BUILDINGS having long clear spans and the increasing owner preference for areas permitting flexible arrangement and rearrangement of floor space in the more standardized buildings is imposing new demands on structures. These requirements along with improved techniques in concrete design, growing contractor interest and experience in concrete construction methods, and the present shortage of structural steel all are acting to create new fields for the use of reinforced concrete. Under these conditions concrete structures are achieving a new and exciting character virtually unheard of just a few short years ago. Medium span shell and plate construction, in particular, has resulted in buildings showing surprising economy when introduced into areas of construction formerly restricted to the use of the more conventional short span framing methods.

Shell construction first was applied largely to simple industrial type structures having large clear

SEARS ROEBUCK'S MIAMI STORE HAS FOLDED PLATE DESIGN WITH SECOND FLOOR SUSPENDED FROM ROOF.

SHELL ROOF OF MIT AUDITORIUM IS SPHERE SEGMENT SUPPORTED AT ONLY THREE POINTS.



AUDITORIUM OF DALLAS CONVENTION CENTER HAS THIN SHELL ROOF SUPPORTED ON 48-FT CANTILEVER FRAMES.

areas difficult to span economically by other means of construction. The inherent grace of these plain and unpretentious buildings was immediately recognized by architects and soon led to a growing number of shells, exploiting the sculptural possibilities of the material.

More recently, as familiarity with the design and construction of shells further increased, the logical question arose as to where shell designs might be used to eliminate some of the restrictive conditions inherent in commonplace short span construction. As a result shell designs now are being applied to a large number of varied structures with interesting and, in many instances, exceptionally successful results. The short span designs, rather than the specialized long span and monumental building work, now appear to offer a range of utilization in which new techniques can change many old design concepts.

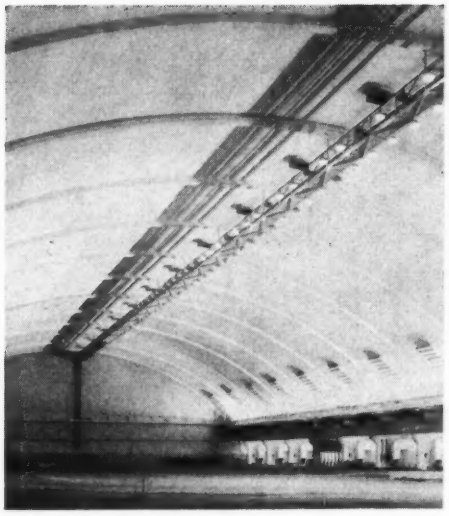
Monumental Buildings

Development of concrete shell and plate construction for monumental buildings has permitted the architect certain freedoms in form and detail that now are culminating in an increasing number of handsome structures. The justification of these buildings lies not in ultimate structural efficiency of the design but rather in achieving desired esthetic and functional effects at an acceptable cost. On these projects the engineer must develop pleasing and logical shapes within the limits of safety and experience without letting preconceived analytical limitations unnecessarily restrict the talents of the architect. At the same time the architect must be cautioned against similar preconceived ideas resulting in forced and contrived arrangements inconsistent with sound structural design.

While concrete shells may not always furnish the cheapest structure for monumental buildings, they often are competitive with more orthodox construction because of greater efficiency in the use of the structural materials and because all or part of expensive, decorative curtain wall materials can be replaced by the structural shell. Accommodation of heating, lighting, acoustical treatment, and utilities in these shells is not particularly costly or difficult. Utility space can be made available and acoustical treatments can be used below the shell (by means of suspended ceilings, catwalks, or grids) as easily as below beam or truss construction.

While the beauty of the shell may be enhanced by exposure of a clean unobstructed curved shell, there are practical limitations to the concept of the thin shell as a completely exposed surface dividing inner and outer space. Instead the shell should be considered as a structural element designed to span space, carrying whatever facilities need to be car-

SANCTUARY OF TEMPLE BETH SHOLOM, MIAMI BEACH, IS A VAULTED, THIN SHELL DESIGN WITH HALF-DOME END CLOSURE.



CAMP RANDALL MEMORIAL FIELD HOUSE AT UNIV. OF WISC. HAS A CLEAR FLOOR 200-FEET WIDE AND 400-FEET LONG.

ried. Then, later it can be exploited for the natural grace and rightness of the structure.

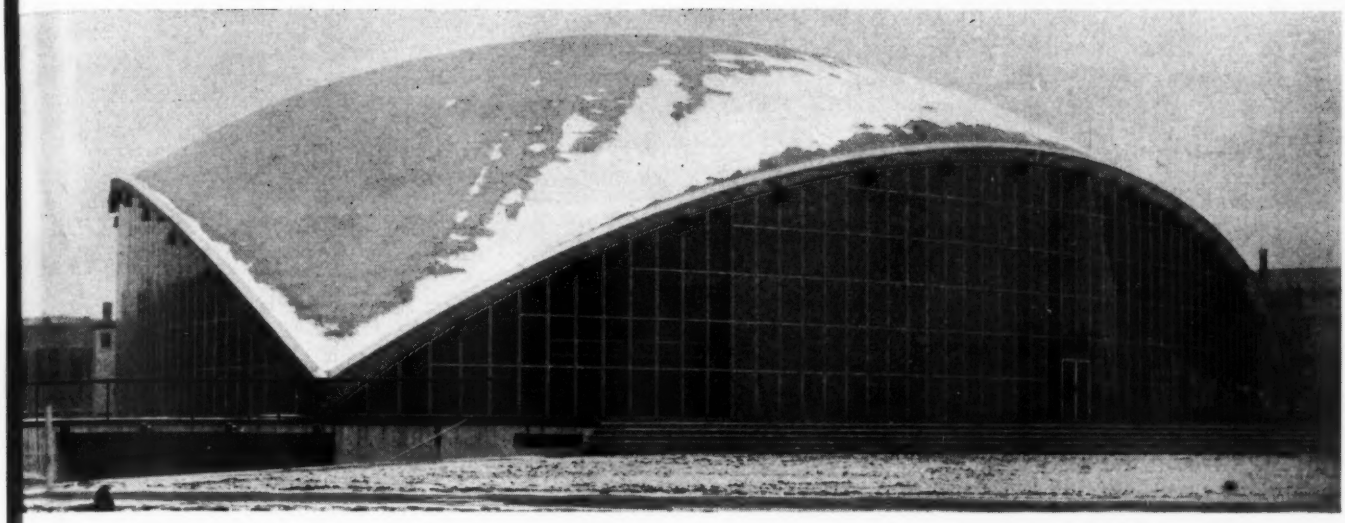
The analysis for such monumental shells is likely to be as varied as the number of shell types multiplied by the number of ways each type can be sliced. The solution usually will follow the pattern of obtaining general membrane stresses, by means such as are outlined in Timoshenko and other standard textbooks, and then modifying these stresses by approximations of membrane changes and flexural effects after careful study and judgment of the effect of free edges and other disturbances. The effect of a local disturbance on the membrane stresses may be determined by a reintroduction of counter forces at the disturbance into the general equations of equilibrium,with the flexural effects often simulated by analogies based on the action of beams on an elastic foundation. The beams in this example could be a segment of the curved shell while the characteristics of the elastic support are fixed by the variation of curvature in each direction.

Shells in general are not particularly sensitive to the usual discrepancies between actual and computed behavior. However, care must be exercised at all times to recognize and provide against lack of support in directions normal to the shell and

BOYD G. ANDERSON
Associate Partner
Ammann & Whitney

Boyd G. Anderson, associate partner, Ammann & Whitney, New York City, has had more than 20 years experience in the design of special structures. He has recently completed the principal structural designs for the American Airlines hangar, Chicago; Alabama State Coliseum; Onondaga County War Memorial; Elgin Air Force Base Hangar; Pittsburgh Civic Opera Amphitheater; and a steel cantilever hangar for the USAF at Chateauroux, France. He also prepared the complete structural plans and specifications for the MIT Auditorium; Milwaukee County War Memorial Auditorium; Dallas Convention Center; new Pittsburgh Civic Auditorium; and a number of other outstanding new buildings.

Mr. Anderson received his CE degree from the University of Wisconsin, in 1936. Before joining Ammann & Whitney in 1949, he was on the design engineering staff of the Bureau of Yards and Docks, U. S. Navy, and he was field engineer on building construction, dredging, and harbor work. He worked on the bombproofing of the Panama Canal locks. Anderson received the Wason Medal Awards, in 1952 and 1955. He is a registered professional engineer in six states and a member of the ACI.



THE THREE SIDE WALLS OF THE MIT AUDITORIUM ARE LIGHT GLASS CURTAINS SUPPORTED ON STEEL FRAMES.

against local distortions, and to prevent flexural failures at free edges, at relatively rigid supports, and at local concentrations of force.

The usual factors of safety ordinarily are used for the steel though this range may be spread somewhat in the more difficult details by including the effects of limiting plus and minus assumptions of change in radius and distortion. The factor of safety against buckling for the shell proper is kept considerably higher than usual factors of safety for flexure (from four to six) to account for errors both in judging the forces occurring on any section and because of difficulty in evaluating changes in curvature and buckling capacity of the concrete material.

Long Span Structures

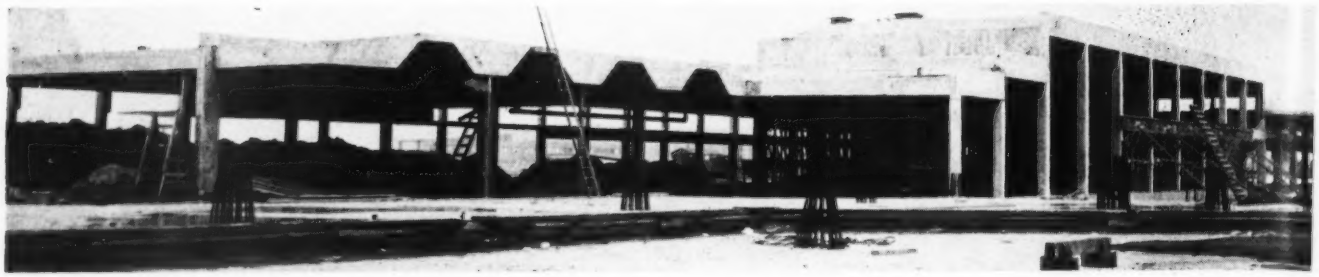
The impressive long span barrel type industrial structures will be found increasingly useful in the future for spanning long halls, auditoriums, coliseums, and similar buildings. This construction was used successfully in early airport hangars but it later lost favor in comparison with cantilever type framing because of the increase in the wing span of planes. However, with the length of the planes growing proportionally to the span, dimensions are becoming such that the cost of the increasingly long cantilevers will soon more than pay for shell vaults sized to accommodate individual planes with each vault containing more or less specialized service facilities.

Analytical methods providing safe, economical design for long span, "short" barrels are now well established, and methods of approximating the effect of local restraints, edges, and openings also can be used with assurance verified by usage. As a result the long span shells are not only sound, efficient structures, but a great deal of flexibility can be built into the shaping of the shell, the assembly of the unit, and the arrangement of the supporting structure. This permits opening up of the framing in adjunct spaces as well as in main large clear spaces.

Design Criteria

Criteria for the design of long span, "short" shells are similar to those of the more monumental shells, but the greater span lengths cause the stiffening ribs to become larger and more important to both the cost and behavior of the shell. The stiffening rib acts to control the curvature of the shell by flexural strength and stiffness. The strength is determined by conservative assumptions of distribution of load from the shell to the rib. The rib then is sized to provide a factor of safety of the same order as provided for usual beams and frames. Inasmuch

THE ALABAMA STATE COLISEUM HAS A CYLINDRICAL THIN SHELL ROOF AND A CLEAR SPAN OF 286 FEET.



ONE-STORY BUILDINGS WITH HIPPED-PLATE ROOFS FLANK FOUR-STORY OFFICE OF PAA HANGAR IN NEW YORK.

as the thrust in the rib may be high, particularly at the lower supporting frames, a factor of safety is selected based on computed requirements using reasonable assumptions of variation in thrust in the stiffening rib. Greater care than this is not usually worthwhile as the force distribution will vary considerably with strain interaction of the shell and rib and changes in radius of curvature. It is not economical to provide great rigidity in the rib, as the shell can easily accommodate and be readily and cheaply designed for fairly large changes in the radius of curvature. The balance between stiffness needed in the rib to reduce secondary stress and the flexibility needed to minimize volumetric effects is an economic problem that should be worked out for each design.

The competitive size range of these buildings runs from spans of 150 feet to actual installations approaching 400 feet and designs exceeding 800 feet. The average shell thickness will vary from 3½ to 4½ inches — the minimum needed to satisfy the local codes and placing requirements. These thicknesses will require the use of stiffening ribs or folds spaced 30 feet or less on center. If designed properly, stiffening ribs will not increase the quantity of concrete in the shell by more than 30 to 50 percent.

Supporting Structure Costs

As the supporting structure and foundations may cost from one-half to one and one-half times as much as the total cost of the roof shell, the importance of controlling these costs is readily apparent. Minimum cost in the supporting structures can be achieved mainly by limiting the height of the barrel spring line, using a fairly high rise to span ratio for the roof and by using single abutments of adequate width wherever possible. If side leanto housing is desired, a single larger abutment with the remainder of the framing composed of light post and lintel construction braced laterally to the abutment usually will be less expensive than awkward heavy framed bents. A high rise reduces the ratio of horizontal thrust to vertical load, thus eliminating the need for expensive deep footings.

Ties across the building usually are inefficient and expensive. The relatively high total load and close spacing of the stiffener ribs and supporting framing make continuous strap footings desirable compared to cantilever type footings. As continuous type footings can be increased in width without adding to either the form or reinforcing steel costs, the vaults can be founded on relatively poor soil materials using low bearing pressures without adding appreciably to the unit cost of the building.

Short Span Structures

Of more importance than the monumental and long span industrial shells (imposing though these may be) is the increasing application of shells and plates to improve space clearances in normal building construction. It is in this field that major changes in general practice are being made in concrete structures. The application is not presently economical or needed for very short span framing (less than 20 to 25 feet) where the greater cost of formwork presently overshadows the savings in structural materials, though even these shorter shells eventually may become economical if the building codes are made more flexible and if the growing precasting industry is expanded to include the molding, casting, and handling of light thin skin shapes. Currently, the main impact of the application begins at the point where the limitations of conventional post and lintel construction begin to restrict the design.

Since a large part of the total cost of these shells depends on the formwork cost, the use of simple straight form segments (folded plates) rather than curved cross sections ("long" shells) is advantageous until the span between folds becomes such that minimum slab thickness and reinforcing steel requirements are increased appreciably by local bending moments. The folded plate shape also helps in stiffening the shell edges, thereby reducing deflections that are somewhat difficult to handle in the shell at walls and other connecting building members. A more important advantage of the folded plates is that compressive stress over continuous supports are handled readily through a wide bottom flange, and the width of both flanges can be varied easily to suit stress conditions and to minimize stress-producing dead loads.

Among the more detailed design considerations, the folded plate design always should be held to minimum weight (skin thickness) in order to minimize

the steel requirements. The use of lightweight structural concrete is also advantageous for this purpose. Forms ordinarily can be used a minimum of three times even on smaller buildings. Inclined slabs can be sloped to a 45 degree angle, but this is about the practical limit in pitch without adding expensive double forming.

Folded Plate Deck Design Criteria

Design criteria of folded plate decks are relatively simple except for certain more unusual edge conditions or sections influenced by prestressing forces and/or curvature in the direction of the span. The section size can be approximated roughly by assuming behavior as flanged beam members. Further stress distributions can be approximated by methods outlined by Winter, and force redistributions caused by deformation of the section can be evaluated by methods such as described by Gaafar.

Several applications of hipped plate construction are shown on the accompanying illustrations.

We designed a 165,000-sq ft office-shop-store space for an aircraft hangar which has 50-ft spans with all framing and utilities (including air conditioning ductwork) confined within a total depth of 3 feet. The hangar itself utilizes a suspended folded plate roof furnishing 150-ft clear cantilever spans. The plates are largely 3½-in. thick, folded in a 6-ft depth on a 30-ft cycle.

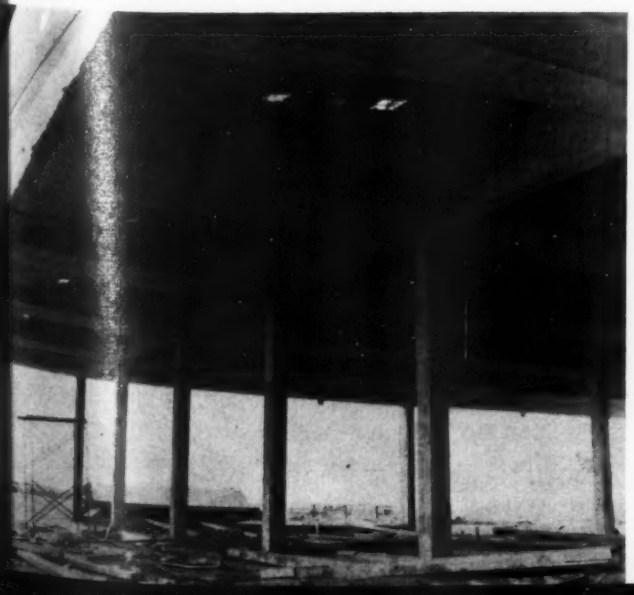
Folded plates are readily adaptable to prestressing, and in this particular installation the horizontal component of the cable pull was used as a principal axial prestressing force replacing the bulk of the reinforcement otherwise needed to span the 150-ft cantilever direction length. Reinforcement in the perpendicular direction is equally light, each slab being only 8 to 10 feet in span. It is loaded only by small distortions and the weight of a thin shell acting under light roof loads. Suspended spans of this type are exceptionally easy to design for the long span, being just heavy enough to resist the uplift forces caused by wind loads and having sufficient cross sectional area to be improved and not penalized by the cable pull.

These roofs also serve well as a protective skin. The flexibility in the transverse direction and the precompression force in the cantilever direction limit temperature and shrinkage cracking. These shells have been subject to ponded water for long periods prior to installation of the membrane roofing and have successfully carried this water without leakage.

The cable supported shells, found efficient and economical for the long spans, become more costly on a unit price basis for the short cantilever spans, for the cost of the strand fittings, anchorage wall, and the prestressing operations are largely independent of the span. For cantilever spans up to 100 to 110 feet, greatest economy can be achieved by shaping the shells from a shallow section at the outer edge to a deep corrugation at the support. Examples of this construction are shown.

Curved and folded shells also can be introduced as independent parts or sections of larger over-all arrangements. Often such installations will provide long spans without beams projecting or otherwise interfering with the interior working space. This may be accomplished using simple forms without the necessity for the beam forming always found so expensive in ordinary construction.

CONSTRUCTION PHOTO SHOWS DESIGN DETAILS OF THE PAN AMERICAN HANGAR AT IDLEWILD AIRPORT.



Concrete Mix

The concrete usually is kept relatively rich (six bags or more per cu yd) to provide density and impermeability rather than strength. The richer mix also accounts for field variations in water needed to suit the consistency to the pouring time and the slope of the thin curved slab.

External Roofing

Most shells in the United States have been covered with conventional built-up roofing applied over conventional insulation. Such installations usually have shown a good experience record. The insulation acts effectively to control condensation and to control volumetric changes, which often can cause stresses in the shell equalling or exceeding normal dead and live load stresses. Insulation can be fastened to wood nailing strips spaced 2 to 4 feet on centers and anchored directly to the concrete. Moldable type insulation materials which follow minor variations in the shell surface have behaved better than rigid type insulation boards, which have a tendency to curl and loosen under foot traffic. To prevent blistering, the concrete should be dry upon application of the membrane, and the binding materials should be selected with some care to prevent gas bubbles.

Roofing and insulation ordinarily will run 45 to 65¢ per square foot and, unfortunately, will be severely limited in color treatment. In Europe, a number of

roofing methods have been used. Bitumastic pastes and asphalts have been applied externally directly to concrete as a waterproofing membrane, though this treatment generally is not considered quite as satisfactory as the felts because of difficulty in controlling blistering and because of possible checking and flow. Single layers of felt over the shell with a double layer in the valleys to provide a 10-year guarantee commonly are used.

Lightweight concrete also is considered suitable as insulation in Europe, but it requires sealing with a waterproofing membrane. In the United States, vinyls, silicones, and acrylics are being tried, though at the present experimental stage this usage is limited largely to roof areas without suspended ceilings subject to water damage from leakage or condensation. Some of these treatments used either in conjunction with lightweight concrete shells which have reasonably good insulating properties or with internal insulation cost much less than external insulation and built-up roofing. They offer the esthetic potentialities by permitting full freedom in color treatment. The possibility of applying acrylics over the shell is particularly promising, appearing to provide a watertight roof while still permitting a limited amount of breathing to relieve vapor pressure.

Insulation

Substitution of structural lightweight concrete for stone concrete can provide a skin of fairly good insulating value. The nominal increase in the cost of the lightweight concrete is small compared to the cost of other insulating coverings and is compensated for by the reduction in design weight. The thermal conductivity of lightweight concrete shells usually will be slightly higher than obtained from normal separate insulation. In another solution, many of the European shells were constructed using permanent pulp or fibre insulating boards as part of the original forms. Where adequate anchorage is provided to prevent curling and loosening, such insulation is reported to be both attractive in appearance and effective in controlling condensation. Because of bond and anchorage problems of the boards, asbestos sprays have been used recently in place of insulation boards, again with reports of providing good thermal insulation and anticondensation control.

Mechanical Installations

Neatly designed and colored utility units and piping can be exposed in excellent harmony and contrast with the shell form. As an alternate treatment, the utilities can be separated from the shell and incorporated in the structure below. Most normal electrical conduit can be buried within the skin of the shell. Closed cell folded plate construction is shaped ideally to house the various utilities.

On a cold storage warehouse having a fairly long span, corrugated, shaped plate roof, metal ductwork planned for distributing cold air was eliminated when the voids within the folds of the corrugated roof were used as circulating chambers. The savings gained by elimination of much of the metal ductwork amounted to approximately one-quarter of the total cost of the roof structure, and the distribution of air with low velocity and low head resulted in a temperature throughout the building said by refrigeration experts to be unusually uniform.

Lighting

Lighting installations have improved in the shell designs, and many methods are available for providing efficient high level intensity at the floor level. Fixtures mounted on or just below the shell can mix direct and indirect lighting in a satisfactory manner. Fixtures also can be mounted in scuttle openings so as to be inconspicuous from below and accessible for maintenance from the top. One unusual lighting application is arranged so that the entire vault is used as a large reflector to maintain light levels adequate for football and baseball activities at floor level. Treating the shell as a reflector is better appreciated with each application.

Acoustics

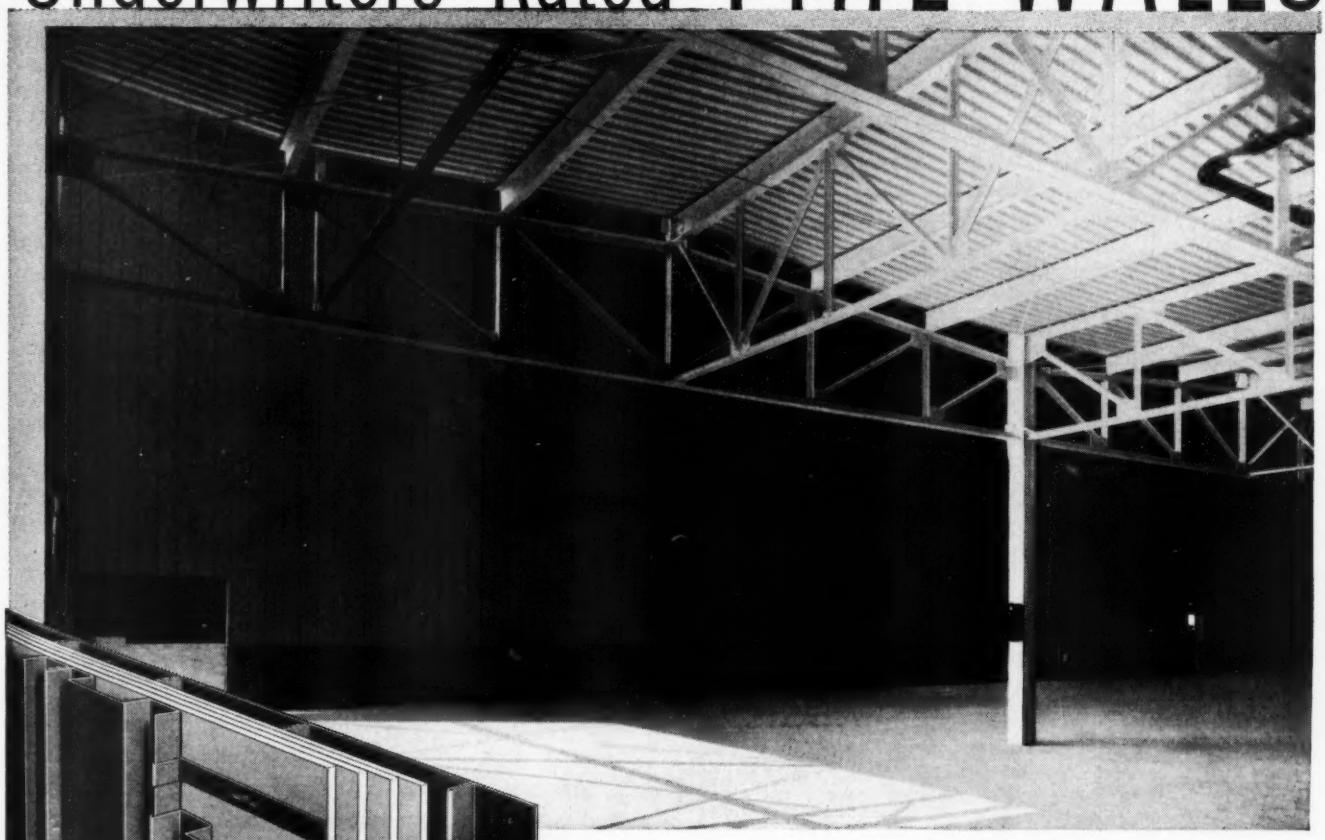
Control over acoustics, where important, can be accomplished in the same way as in other buildings by means of auxiliary panels and materials. However, while the natural soffit surface of the shell is ordinarily hard and reflective, it is usually relatively high above the floor with an often variable radius of curvature many times the shell height. The rooms accordingly are only somewhat, and sometimes pleasingly more resonant than in standard construction.

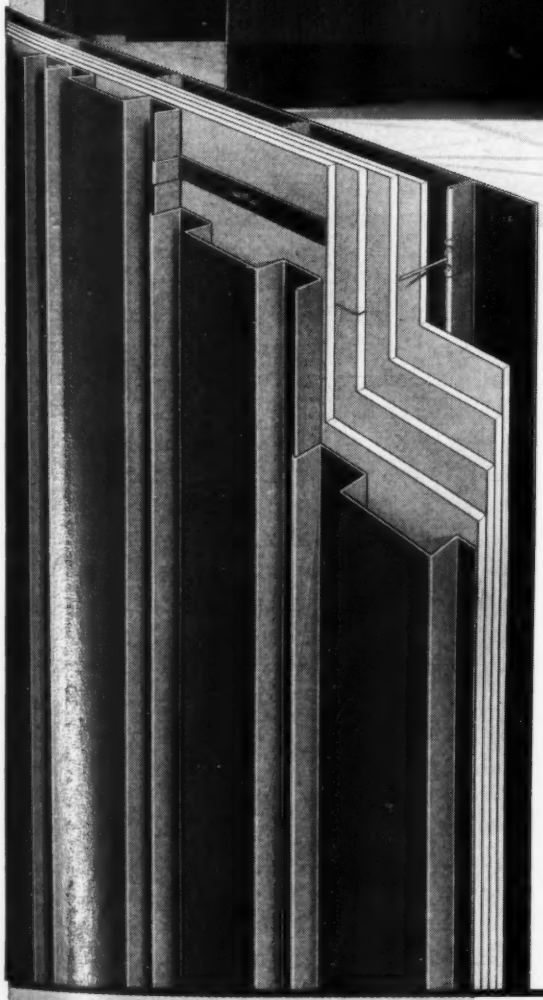
Surface treatments of acoustical plaster are partially sound absorptive and have been applied to the interior soffits in this country and abroad, with results judged by most people as offering a measure of acoustical control adequate for most public building usage. The reports of these installations are of particular interest, as the acoustical plaster also adds considerably to the insulating value and condensation control of the skin. These installations will offer unusual freedom in the esthetic treatment of the exterior shell surfaces if they can be used as reported without causing condensation problems.

Costs

To explore the factors affecting the cost of monumental and long span shell roofs, it is necessary to assess the cost of the materials and labor involved in the construction. These costs may be conveniently divided into the separate costs of the concrete, the reinforcing steel, and the various operations attached to the forming of the concrete. The total concrete in the roof will vary from approximately 5½ inches for 150-ft spans to 10 inches in thickness for 300-ft spans (including the ribs and diaphragms), and this con-

Underwriters' Rated FIRE WALLS





Section of Mahon Metalclad Fire Wall showing Construction Features. Four layers of ½" Plaster Board are sandwiched between Roll-Formed Steel Wall Plates. All Joints in both Wall Plates and Plaster Board are Offset.

. . . for Interior or Exterior Use!

Mahon Underwriters' Rated Metalclad Fire Walls are now available for use as interior dividing fire walls or as exterior curtain-type fire walls. They can be installed in old or new buildings, of either steel or reinforced concrete construction, where a fire hazard may exist, or where the requirements of Fire Insurance Underwriters or Building Codes must be met. The Mahon Metalclad Fire Wall is field constructed. It has been tested by the Underwriters' Laboratories, Inc., and has been given a Two-Hour Rating for use as either an interior or exterior fire wall. When employed as an exterior wall, Fiberglas insulation can be inserted between the interlocking ribs of the inner wall plates, thus providing insulating properties superior to that of a conventional masonry wall with furred lath and plaster. Exterior Wall Plates may be Aluminum, Stainless Steel or Enamel Coated Cold Rolled Steel. The important feature of the Mahon Fire Wall is the Impaling Clip with its Stainless Steel Spike (Patents Pending) which permits construction of the wall with only .0048 sq. in. of through-metal per sq. ft. of wall area. Mahon engineers will cooperate fully in supplying information and assistance in adapting this product to your particular requirement.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago • Representatives in Principal Cities

Manufacturers of Underwriters' Rated Metalclad Fire Walls; Insulated Metal Curtain Walls; Steel Roof Deck and Long Span M-Decks; Acoustical and Troffer Forms; Electrified M-Floors; Rolling Steel Doors, Grilles, and Underwriters' Labeled Rolling Steel Fire Doors and Fire Shutters.

MAHON

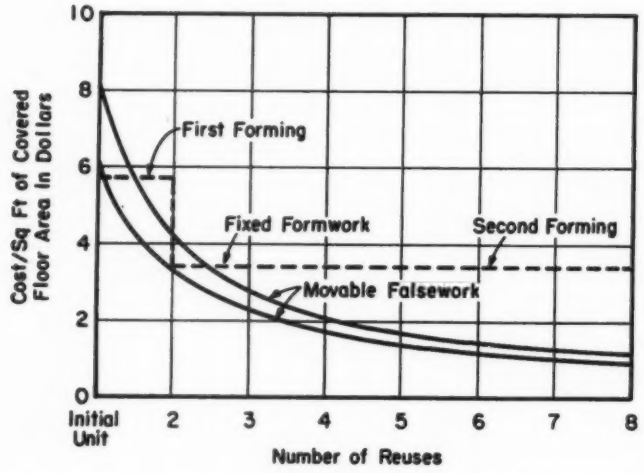


FIG. 1 — TYPICAL COST CURVES FOR ROOF FORMWORK.

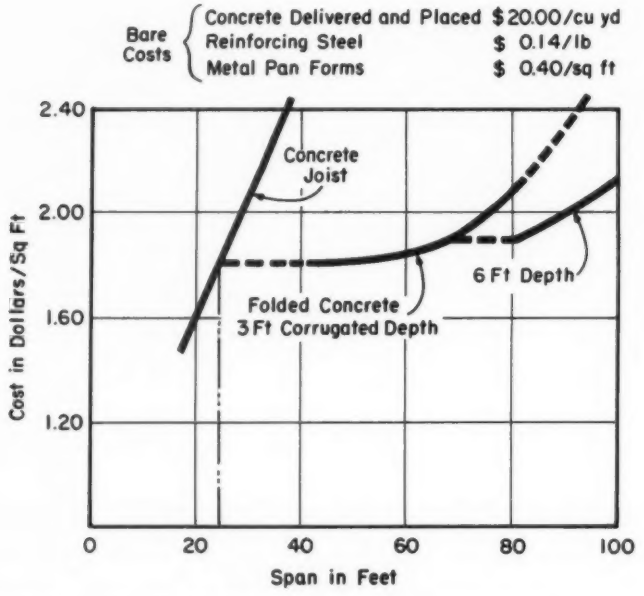

Bare Costs
Concrete Delivered and Placed $20.00/cu yd
Reinforcing Steel $ 0.14/lb
Metal Pan Forms $ 0.40/sq ft
Concrete Joist
6 Ft Depth
Folded Concrete 3 Ft Corrugated Depth
Cost in Dollars/Sq Ft
Span in Feet

FIG. 2 — CURVE SHOWS VARIATION OF COST WITH SPAN.

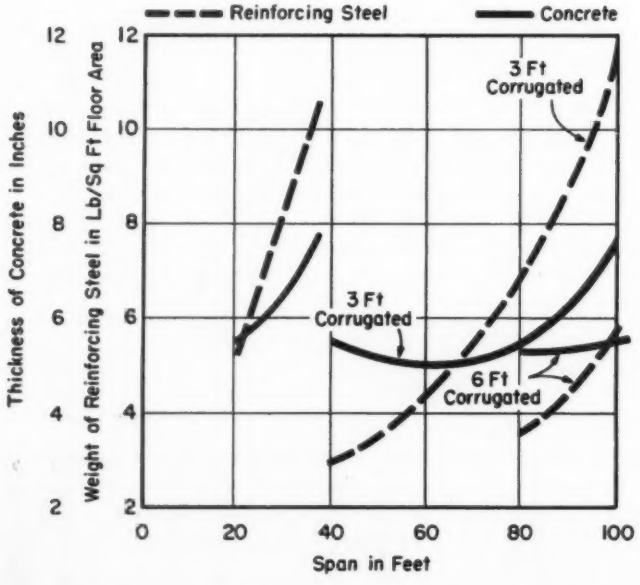


FIG. 3 — MATERIAL REQUIRED FOR VARIOUS SPANS.

crete material in place, exclusive of formwork costs, will cost from 35¢ per square foot for the short spans to 60¢ per square foot of floor area for long spans.

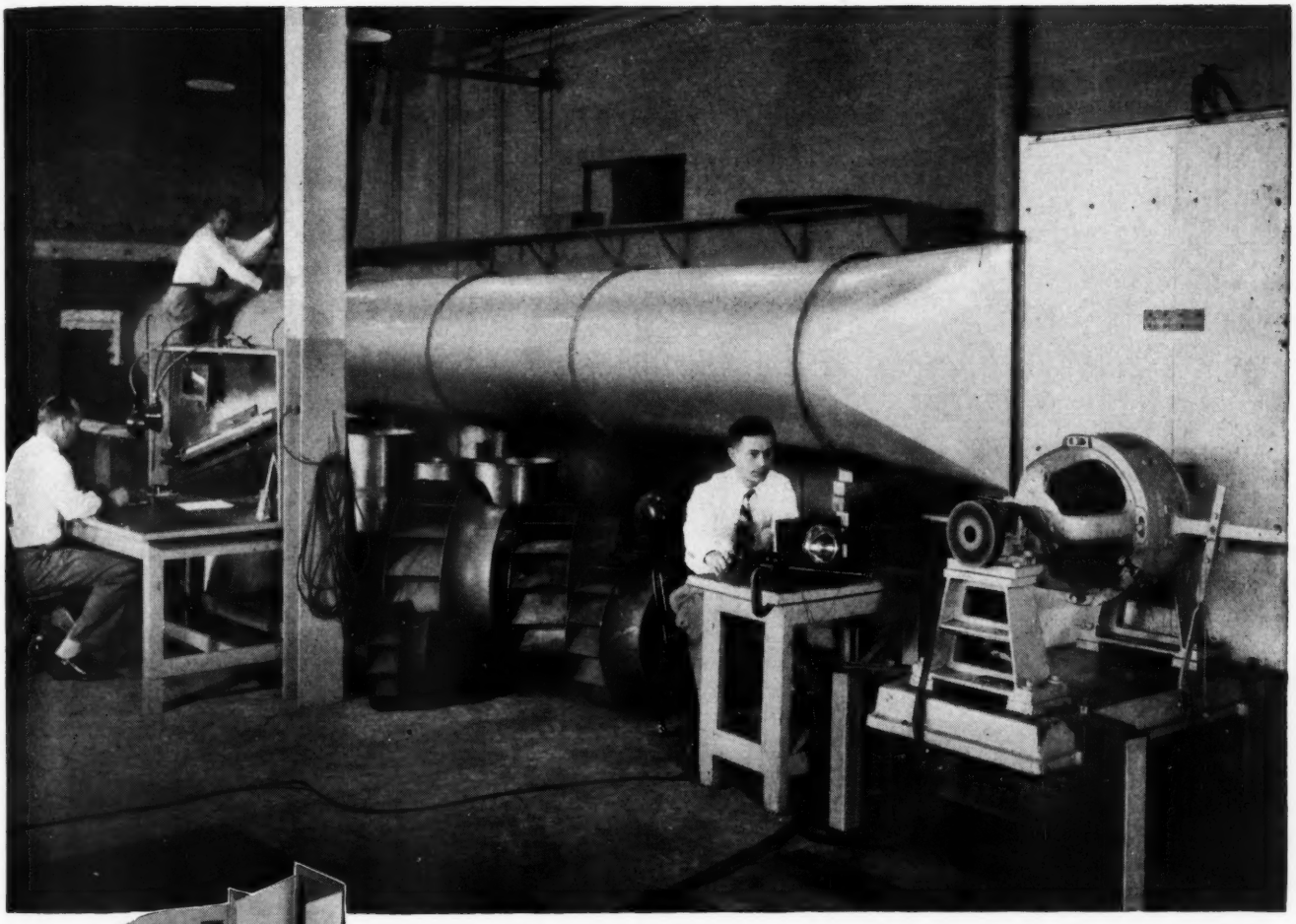
From 5 to 8.5 pounds of reinforcing steel will be required per square foot, depending on the length of the span. The steel will cost from 12 to 21¢ per pound, depending on the area, labor conditions, size extras, and fabricating and placing difficulties. This will result in unit costs of 60¢ to $1.40 per square foot for the reinforcing steel in place. Formwork and falsework costs may vary from $4 to $5 per square foot for high formwork having a single use to 85¢ per square foot or less for an efficient movable formwork used approximately 10 times.

Concrete placement costs on folded plate roofs during 1955-56 ran from $4.50 to $6.00 per cubic yard.

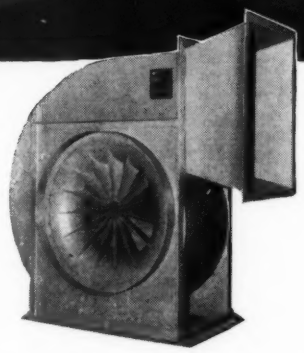
Insofar as cost advantages are concerned, shell designs now have reached a point where the thickness of the shell usually will be governed by building codes or by the dimension needed to install and protect the reinforcing steel. Ordinarily, little savings in shell thickness and reinforcing steel quantities can be accomplished by shaping of the shell to provide minimum shell stress. However, the stiffening rib size may increase appreciably if care is not exercised in the selection of the shell curvature. These ribs usually are shaped to eliminate dead load bending stress. The reinforcing steel quantities can best be reduced by controlling the requirements of the stiffening rib, and cost can further be reduced by using larger bar sizes, set in simple rectangular patterns in the shell.

The relative costs show that single use formwork is the largest single item of cost in long span concrete shell structures. Form economies can be obtained by planning self-supporting and similar sized and shaped shell segments so that a small sector of form can be used a large number of times on a large roof area. Fig. 1 provides typical cost curves for formwork.

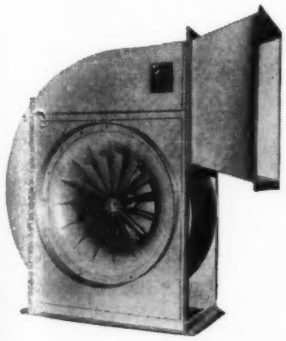
In considering the economy of the shorter span shells, commonplace flat slabs, waffle slabs, and concrete joist construction are normally economical for spans up to 25 or possibly 30 feet, but the limit in span at reasonable cost is then reached. At this point, much greater spans can be obtained by folding or curving the slabs at little increase in unit cost. Fig. 2 indicates an approximate cost comparison showing the variation of cost with span. The reason for the gain in span at little cost is shown by the material quantity requirements plotted in Fig. 3. While these costs will vary with the area, simplicity, and size of the building, and the contractor's evaluation, the relative value of the cost points has been established by comparative design studies, by actual bids obtained from alternate plans, and from shell designs entered into competition with plans based on the use of other framing methods. Because of such favorable results, engineers have been encouraged to use shell construction for many types of buildings on a strictly competitive basis. ▲▲



Complete Test Setup at "Buffalo" to Check Fan Wheel Performance Over Entire Range of Operation.



92% Mechanical Efficiency — attained by the "Buffalo" Airfoil Fan.



"Buffalo" Type BLH Fan for Classes II - IV air handling.

WE PAY THEM NOT TO BE SATISFIED —SO THAT YOU WILL BE!

Fan designing and testing at "Buffalo" are jobs that are never "completed" — because once an improved model tests out, our engineers go back to work on a better one!

That's the spirit of dissatisfaction which developed the series of "Buffalo" Airfoil and Semi-Airfoil Fans with choice of wheels to match widely varying requirements — the Types BL and BLH Fans to cover all pressure classifications. And though these fans have set new records for efficiency and stable performance, the work still goes on toward even higher goals. Meanwhile, you get the benefits: the best of hundreds of tested fan designs — the most complete selection of fans for the exact performance you require — the *"Q" Factor or built-in Quality which provides trouble-free satisfaction and long life.*

Write for Bulletins F-200 and FD-106. See why "Buffalo" means a better fan buy.

BUFFALO FORGE COMPANY
BUFFALO, N. Y.

"Buffalo"

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

This report prepared for the Oregon Association of Consulting Engineers shows what clients and prospective clients in industry and government think of engineers in private practice.

The Consulting Engineer...

As Others See Us

STAFF

CE exclusive

THE CONSULTING ENGINEERS Association of Oregon, formed less than one year ago, knew it had problems. But just what were the obstacles to be overcome? What did the public really know, and think, about the engineer in private practice? What were the assets of the young and energetic group of Oregon consultants, and where was a bit of introspection needed?

To Know What to Do

To learn the urgency of their problems, and how best to go about obtaining an orderly program for the future, the Oregon group hired a public relations firm to make a survey that would show the consulting engineer just what outsiders liked or found to criticize about him.

The survey was conducted by Dr. Eric J. Weiss, of SCORE, an affiliate of Northwest Public Relations Consultants. Questionnaires were sent to 2300 persons in Oregon and surrounding areas of the Pacific Northwest.

Since opinion is not always limited by geography, the survey might be a mirror showing what many groups all over the nation think of the engineer in private practice.

The Manufacturers

Among the groups receiving questionnaires were a number of leading manufacturers and other suppliers in the Pacific Coast area.

Choosing the direct approach, the survey asked manufacturers and other suppliers if they provide "engineering design to owners." Nearly 80 percent of those replying explained that they do provide "free engineering," although many qualified their answer by explaining that they do so only on request. With few exceptions, the suppliers said they provide the service as the best way to assure proper application of their product, and as a part of their company's sales policy.

"It is not our policy to engineer jobs. We have, however, been forced into engineering by the lack of unbiased engineers in this area," one supplier wrote on his copy of the questionnaire.

However, regard for the capability of engineers in private practice was shown, when 79 percent of the suppliers stated that they think it advisable to

have a consulting engineer acquainted with the individual project on the scene — even when engineering service from the supplier had been requested by contractors, owners, or others.

If you do not provide engineering services, why not, the suppliers were asked.

All said they feel a consulting engineer assures the proper application of their products. The unbiased service of the consulting engineer is in their best interest, 86 percent added, and 57 percent said their reason for not giving "free engineering" is that it is against their policies.

Federal Agencies

Next, questionnaires were sent to federal agencies, city bureaus and commissions, state agencies, county boards and commissions, and school districts.

Of the responding public agencies, 68 percent use the services of consulting engineers. Of those using the services, 90 percent use them for specialized work not in the range of their own engineering departments. Only 31 percent employ the consulting engineer to supplement their staffs on work normally within the range of their own personnel.

Ranked in the order of the extent to which they use the services of consultants, the groups were:

City Bureaus and Commissions
School Districts
County Boards and Commissions
Federal Agencies
State Agencies

A majority of all groups (with the exception of county boards and commissions) favored greater use of consulting engineering talents.

More than 64 percent of the public agencies reported satisfactory experiences in the past with consulting engineers. The dissenting minority listed their reasons for unhappiness as errors and omissions in design specifications, failure to meet deadlines, and (0.7 percent) lack of cooperation.

The level of fees paid engineering consultants has caused few worries to the public agencies. About 64 percent said they have no difficulties in attracting adequate services by consulting engineers with their present fees. And only 11 percent thought their departments would benefit by raising and stabilizing the fee level for consultants.

The survey also showed that in a number of cities, consulting engineers had set their own fees — refusing to take the risk of rising above the accepted level in the particular area involved.

"Nobody reasonably can be expected to pay more for a service when he can get it at the old price. The raising of fee levels for a whole profession is to be achieved by collective action, and this is where CEAO has to step in," the survey concluded.

Another group, chosen because they occasionally use the services of consulting engineers, were queried. This group included public institutions, finance institutions, trade and professional associations, chambers of commerce, and organizations whose regular functions have a bearing on activities in the building construction trade.

What is a Consulting Engineer?

This group seemed confused as to exactly how often they use the services of consulting engineers, but the reason was apparent from one comment — "You do not say what in your opinion is a consulting engineer."

At least 64 percent of these "special publics" have employed consulting engineers. And 80 percent think engineering specialists would provide them with more economic service.

Central Engineering Departments

To ferret out the actual and potential clients in industry, the survey learned that more than 85 percent of the manufacturers have engineering departments. And of these, about 67 percent make engineering designs for plant expansion projects and improvements. Only about one-third of the engineering departments, however, have personnel that are able to design a project in entirety.

When independent engineers are used by industry, about 67 percent call the consultant directly, while the remainder leave the responsibility for the engineering to architects or contractors.

When asked if they thought consultants could prepare engineering designs more competently than could nonspecialized engineering staffs, 71 percent of the industrialists said "Yes." However, when asked if it could be done more economically by consulting engineers, only 62 percent answered in the affirmative.

An optimistic note was provided by the 81 percent of the industrialists who expressed satisfaction with past services of consulting engineers.

Hiring Engineers

When personnel managers were questioned, 50 percent said they are having difficulties in recruiting new engineers to meet the demands of their company engineering departments.

A majority consider other organizations as the best manpower reservoir for their engineering staff requirements, while a minority depends on applicants coming directly from engineering school.

Suspicions of some consulting engineers were confirmed, when the personnel managers reported that more than 14 percent of their job applications are from the offices of engineers in private practice. A majority of the applications, however, come from other industries, and 28 percent come from government and public agencies.

The greatest attraction to applicants, according to the personnel managers, is the chances of promotion offered by private industry. Initial salaries and

regular pay increases also were listed as assets, along with the reputations of the firms.

However, only 36 percent of the firms encourage their young engineers to specialize, and only 29 percent offer facilities for advanced engineering studies to their employees.

The Student Engineer

While college enrollments were at an all-time high in 1956, only 9 percent of the boys attending college are preparing for engineering careers. And from the standpoint of the independent engineer, the situation is not helped by the fact that a majority of engineering graduates are attracted by careers other than working with consultants.

Identical copies of the Oregon questionnaire were sent to engineering students and to their teachers.

Students prefer careers with:

Private industry	49.0%
Eventually opening own office	20.7%
Employment with engineering firm	16.9%
Federal government	9.4%
Public offices other than federal	9.4%

Teachers thought the most attractive engineering careers are with:

Private industry	50.0%
Eventually opening own office	50.0%
Employment with engineering firm	12.5%
Public offices other than federal	12.5%
Federal government	——

While student and teacher opinion varied, the teachers reported that more than 72 percent of the students eventually wind up working for private industry, with the smallest number of students going to work for the federal government.

By graduation time, almost 38 percent of the students who originally planned to work with a consulting engineer have changed their minds and get work elsewhere.

When asked what is most important in determining their career choices, the students preferred:

Possibilities for specialized study	47.1%
Job security	35.8%
Self employment, professional satisfaction	33.9%
Earnings	
a) Initial salary	15.0%
Regular raises	15.0%
Possible top salaries	30.2%

The teachers thought the most important aspects of a job should be:

Self employment, professional satisfaction	50.0%
Job security	25.0%
Earnings (each bracket)	25.0%
Possibilities for specialized study	12.5%

Students and teachers agreed that they receive less information about consulting engineering than any of the competitive fields.

In the conclusions to the survey, Dr. Weiss said the basic problem for the Oregon group to attack is the gaining of professional recognition by the public. He suggested that the program first should be limited to groups presently having frequent or sporadic professional contacts with consulting engineers, to nonaffiliated consulting engineers, and to engineering students.

An invitation letter should be sent to nonaffiliated consulting engineers. In the language of professional colleagues, the letter would report on CEAO progress, and explain the organization's aims.

Publications

A monthly CEAO Bulletin should be planned to report on the Oregon group news and consulting engineering associations elsewhere. This should be sent to CEAO members, to nonaffiliated consulting engineers, to contractors associations, to architects associations, to chambers of commerce, to industrial associations, to trade associations, to government agencies, to public libraries, and to the faculties of engineering schools.

A brochure, explaining the history and function of consulting engineers, and a pamphlet adding the career possibilities for students, also should be prepared, the survey adds. Regarding this activity, the CEAO board of directors feels this type of brochure should be prepared by the Consulting Engineers Council and distributed on a nationwide basis rather than by the Oregon Association only.

Discussion forums, lectures, and social events should be planned with local chapters of related professional associations, school authorities, engineering faculties, students, and employees of consulting offices.

Purposes of these programs, according to the survey, would be to discuss matters of common interest, to straighten out controversial questions, and to allow the groups to take collective action whenever necessary. All of these activities would be served and coordinated by a CEAO Speakers' Bureau set up by the Association.

Information should be prepared for professional journals, the trade press, and metropolitan newspapers.

Oregon Knows the Answers

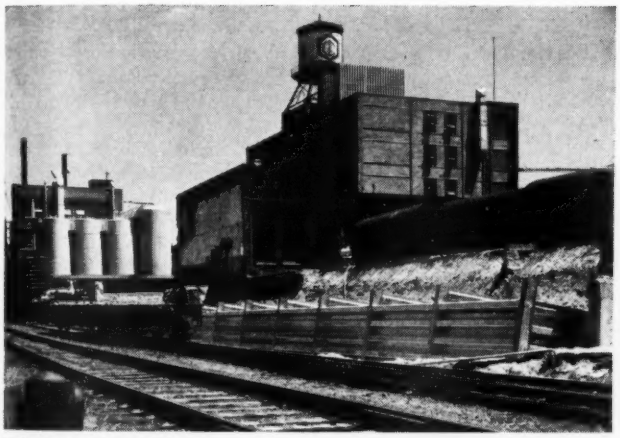
Much of the information learned from the survey might have been guessed by the members even if the survey had not been made. In fact, several of the other state associations, and to some extent the Council itself, had come to about the same conclusions as to the type of publicity program needed. But the survey served an excellent purpose in that it put each step of the proposed program into its proper relative position. Pet projects cannot become unduly important while vital works are overlooked. Oregon now *knows* what it needs. ▲▲

How Armco Products can help you expand without more land

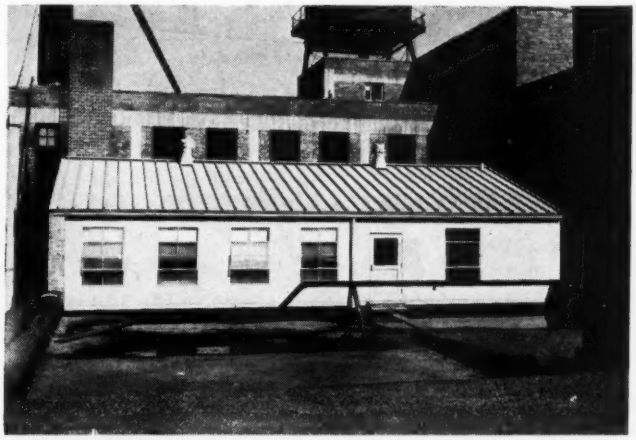
More and more industrial plants are needing more room for expansion. And often, no more ground is readily available. What to do? For some of these problems, Armco Construction Products offer an easy, economical solution. Perhaps you may be able to use some of the ideas shown on this page.

More than 30 Armco Products for drainage and construction work are specified by industrial, highway, railroad and municipal engineers. These products are backed by more than 40 years of manufacturing experience. They are made of strong, durable steel, economical and easy to install, and available in a wide range of sizes.

For complete engineering data on Armco Products, write us. Armco Drainage & Metal Products, Inc., 4947 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.



LAND SALVAGED—With an Armco Bin-Type Retaining Wall, shown partly erected, this plant makes maximum use of right-of-way. Tanks at right are buried underground behind the Armco Wall. Ground above the tanks will still be open for expansion.



ROOF-TOP OFFICE—This industrial plant, needing more office room but having no more ground available, installed an Armco Steel Building on the roof of an existing building. The relatively light weight of the frameless Armco Building made this structurally possible.

STREAM ENCLOSURE—These pre-assembled Armco MULTI-PLATE® Pipe-Arch structures will serve as an industrial stream enclosure. After installation the drainage structures will be covered with earth, hiding the stream and making the area suitable for future expansion.

MORE PARKING SPACE—This is a well-planned industrial parking lot, with marked spaces defined by Armco FLEX-BEAM® Guardrail. This permits the parking of at least 25% more cars than on unplanned lots. The area saved may be used for additional cars or other expansion.

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Bin-Type Retaining Walls • Corrugated Metal Pipe and Pipe-Arch • PAVED-INVERT® Pipe and Pipe-Arch • ASBESTOS-BONDED® Pipe and Pipe-Arch • SMOOTH-FLO® Sewer Pipe • Perforated Pipe • MULTI-PLATE Pipe, Arch and Pipe-Arch • Welded Steel Pipe • Pipe Piles and Pile Shells • Water Control Gates • Steel Buildings • FLEX-BEAM Guardrail • Steel Sheeting • Liner Plates • End Sections • Bridge Plank

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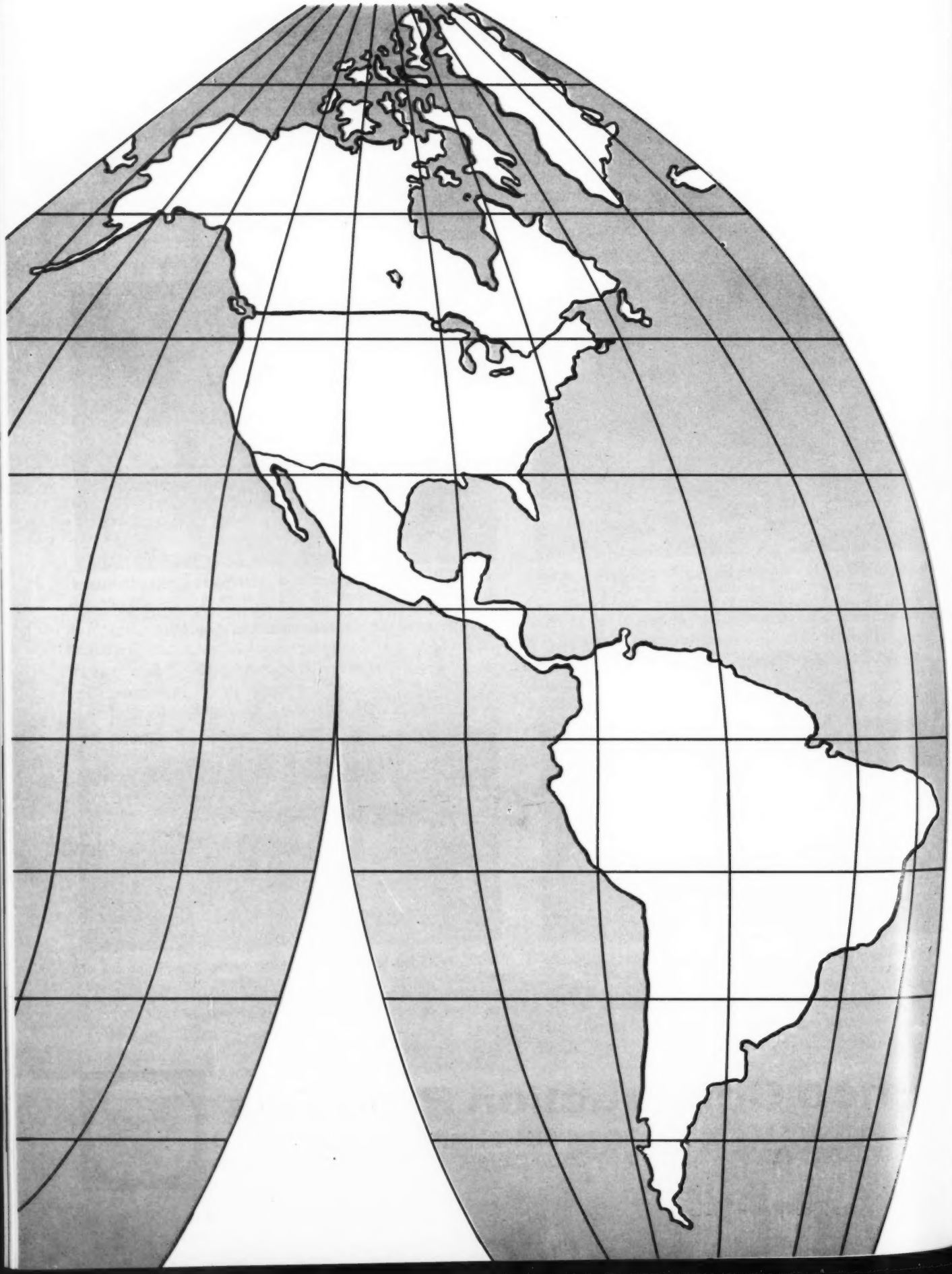


A Western Hemisphere Trade Corporation

Whether your firm is a partnership or a corporation, it can own a Western Hemisphere Trade Corporation and can take advantage of sizeable tax deductions on all income from work done outside the United States but in the Western Hemisphere. If you are doing foreign work in this part of the world, you should know the facts.

EDWARD KENNEY
Attorney at Law
Benton Harbor, Michigan

IN A RECENT SURVEY conducted by this magazine, it was found that about 20 percent of the consulting engineers in this country had undertaken, at some time in their firm's history, work in a foreign country in the Western Hemisphere. The survey indicated that approximately two-thirds of the foreign work done by U.S. engineers had been in Canada, Central America, South America, or the West Indies. The fees for these engineering services amounted to a great deal of money, and the taxes paid on that income by consulting engineers probably ran into many millions of dollars. Yet, had the engineers known it, a good part of this tax need not have been paid at all. It may be too late to get back any of the taxes paid in past years, but action now can prevent your paying more than the government demands on income from your next foreign project in the Western Hemisphere.

Not Many Know

To oversimplify somewhat, it is possible for a consulting engineer to get a substantial tax deduction on income from Western Hemisphere work. A few consulting engineers are taking advantage of this permitted deduction, but most are ignorant of those sections of the Internal Revenue Code that make this special deduction possible.

Engineers should not feel too badly about this. Many lawyers are also ignorant of those sections. When you go to an attorney to have him arrange your affairs so that you can take the special deductions permitted, you probably will find that he will have to make a fresh study of the Code before he can outline the steps you should take.

Nothing about income tax law is simple, but if you are now doing — or plan to do — any foreign work in the Western Hemisphere, you should go to your attorney or tax consultant and ask him to study Sections 921 and 922 of the 1954 Internal Revenue Code — Western Hemisphere Trade Corporation. For your own guidance, get a copy of the code and read it yourself.

Get A Tax Lawyer

The steps you must take in order to participate in this present tax deduction are not too complicated. But you will need a good tax lawyer to lead you. It probably will be worth it.

Let us assume that you currently are operating as a partnership. You recognize a good potential for your services in Canada, Central, or South America, and you feel that it is likely that you will be able to get some foreign work this year and in the years ahead. Naturally, you do not want to pay the Federal Government any more in income taxes than is required by law.

If this approximates your current business outlook, go to your lawyer and ask him to set up for you a domestic subsidiary corporation, including in the charter the necessary statements of intent so that this firm will comply with the definition of a Western Hemisphere Trade Corporation as provided in Section 921 of the 1954 Internal Revenue Code. This is simple and inexpensive. This corporation will issue stock, and the partners in your current firm can be the sole stockholders. This means that your engineering firm, a partnership, owns a corporation. This has no more effect upon the operation of your old firm than would ownership of

stock in General Motors or any other corporation. You go right ahead with your regular engineering work as a partnership. If you should be operating currently as a corporation, that makes no difference. The corporation would become the owner of the stock in the new Western Hemisphere Trade Corporation set up by your lawyer.

Code Restrictions

After your Western Hemisphere Trade Corporation is chartered, all that you have to do is to be sure to operate within the restrictions imposed by the Internal Revenue Code, and then you are permitted to take the special deductions allowed when you pay taxes on the income of your new corporation. This deduction is equal to 26.923 percent of the corporation's taxable income and makes the effective tax rate 21.9 percent on the first $25,000 of income instead of the normal 30 percent, and 37.96 percent instead of the normal 52 percent on income in excess of $25,000.

Unfortunately, the full meaning of any law is seldom clear until cases have been tried and the courts have come forth with decisions, and there have not been any cases brought to court having to do with this particular section of the Internal Revenue Code. Therefore, all your lawyer can give you is his opinion based upon what appeared to be the intent of Congress in passing the Act. No one can positively assure you that you are acting within the limitations of the Code, but there do not seem to be too many specific points included that would permit varied interpretation.

Encourage Foreign Trade

What Congress intended seems rather clear and has an interpretable history. Preferential treatment for income of foreign origin goes back to 1918, just five years after the enactment of the first federal income tax law. At that time a credit was provided for persons paying foreign income taxes.[1] Then, in 1922, a credit was allowed to a China Trade Corporation for dividends paid out of income derived from China.[2] This act was considered an encouragement to China trade, which was desirable in 1922 — but is not so warmly endorsed in 1957.

In 1924, income from United States possessions was excluded from tax if 80 percent of that income had been derived from possessions for as much as three years, and if 50 percent of it was from the active conduct of a trade or business.[3] Two years later Congress provided for exemption for income earned from a foreign source by individual citizens who resided outside the United States,[4] and then, in 1934, corporations were provided a credit for taxes paid to a foreign country by a foreign subsidiary of a U.S. firm.[5]

In 1942, while we were engaged in a two-front war which practically eliminated commercial shipping in the Western Hemisphere, Congress carved out a new tax policy. Our State Department had developed a foreign policy that was facing south. We were starting on our "Good Neighbor Policy" toward the other nations of the Americas. This trend was clear despite the turbulence and exigencies of an Asiatic and European war. It was in the Revenue Act of 1942 that the Western Hemisphere Trade Corporation was first defined, and in connection with that original definition, complete surtax and excess profit tax exemptions were provided.[6]

In 1950, this exemption policy was modified by the creation of Section 26 (i) for the 1939 Code.[7] This provided for normal tax net income credits of 33 percent for the calendar year 1950 and slightly reduced credits for succeeding years up to April 1, 1954. The credit was set at 30 percent for the taxable years subsequent to March 31, 1954.

Code Revision

It will be recalled that Congress enacted a complete revision of the Internal Revenue Code in 1954, and when they did, they took a new look at this Western Hemisphere Trade Corporation policy. Although not entirely satisfied with the policy, the House was reluctant to institute any changes that might bring about a disturbance in established channels of trade. In fact, the House was of a mind to broaden the Section a bit and make it possible for Western Hemisphere Trade Corporations to make incidental purchases outside the hemisphere without being disqualified from the tax benefits. The Senate agreed with this, but favored limiting this broadening to taxable years subsequent to January 1, 1954. The House proceeded to rewrite the Section, replacing the previous credits, which over the years had ranged from 33 to 27 percent, with a new deduction based upon a fraction of net taxable income. In practice, the deduction of the 1954 Act is substantially equal to the credit allowed under the old Act.

The Current Law

The new statute was passed as part of the Internal Revenue Act of 1954, and it is in that form that it now stands on the books.

Treasury Department regulations (Regulation 118: Section 39.109-1) explain just how a corporation must function in order to comply with the requirements of the Act. These regulations explain that the entire business of the Western Hemisphere Trade Corporation must be conducted within the Western Hemisphere except for incidental purchases made outside. But at least 95 percent of the gross income must come from Western Hemisphere sources outside the United States. As to time limitations, a newly formed Western Hemisphere Trade Corporation is apparently permitted by

Net Tax Saving Operating as a Western Hemisphere Trade Corporation

This table was prepared by L. William Seidman, C.P.A., Seidman & Seidman, Grand Rapids, Mich.

Taxable income	$25,000	$50,000	$100,000
Less special deduction as a Western Hemisphere Trade Corp. (taxable income x 26.923%)	6,731	13,462	26,923
Taxable income	$18,269	$36,538	$ 73,077
Normal tax at 30%	$ 5,481	$ 7,500	$ 7,500
Surtax at 22% (on excess over $25,000)	—	2,538	10,577
Net United States tax payable	$ 5,481	$10,038	$ 18,077
Income tax payable if income had been added to parent company's United States income*	13,000	26,000	52,000
Difference	$ 7,519	$15,962	$ 33,923
Less intercompany dividend tax (7.8%) on net earnings after tax transferred to parent company	1,523	3,117	6,390
Net tax saving through Western Hemisphere Trade Corporation	$ 5,996	$12,845	$ 27,533

*Assuming the parent company's income from United States business is in excess of $25,000.

Treasury Department policy to qualify immediately, provided it meets the other requirements. Further, 90 percent of the gross income must come from active conduct of a trade or business. And, in the meaning of this act, professions and personal services are "businesses."

The Tax Return

When it is time to fill out a tax return for the corporation's income, the Treasury Department requires the taxpayer to attach a statement disclosing the following information:

¶ The extent of its business within the designated area for the statutory period.

¶ Total gross income for the period from all sources.

¶ Total gross income for the period derived from the active conduct of a trade or business.

¶ A factual description of the trade or business demonstrating the actual character of the work.

¶ Total gross income for the period from sources within the United States.

After the information is supplied, the origin of the revenue is determined under Treasury rules and regulations formulated under the authority of 1954 I.R.C. Sections 861-864. If all goes well — and it should — you have legally and honestly saved yourself a good sum of money.

No Court Interpretations

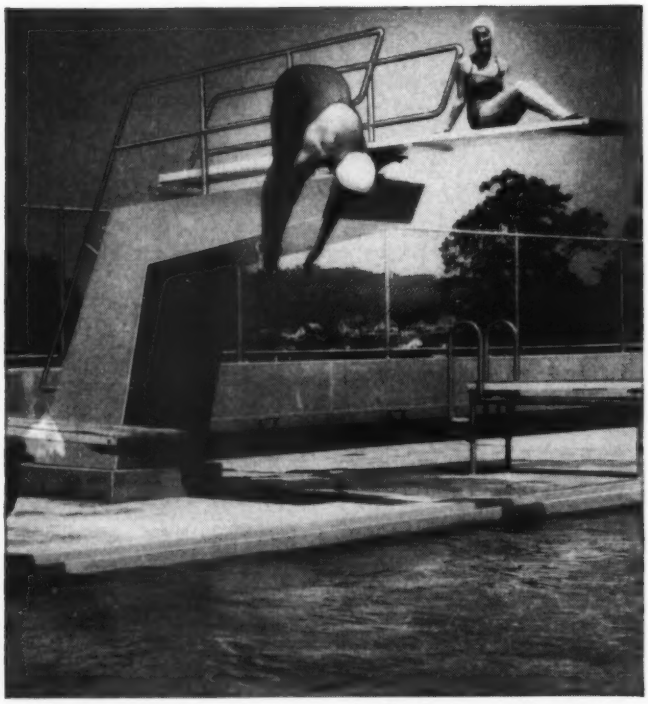
There are no court opinions to help your attorney determine just what is "active" participation or just what constitutes "income from sources without the United States," but income paid to a foreign office for services performed on foreign soil is foreign income. It would not seem necessary, however, for payment for personal services to be made to a foreign office. Based on cases involving other sections of the Internal Revenue Act, it would seem that the test of whether income is from a foreign source is based upon where the income is earned rather than where the money changes hands. This was decided in the case of the East Coast Oil Company.[8]

Certainly, the Act does not specifically require a foreign office for a Western Hemisphere Trade Corporation. An agent located on foreign soil performing a service or conveying a preliminary report or a set of blueprints perhaps would seem to be sufficient to establish the income as being foreign. However, compensation for personal services such as engineering design and supervision of construction currently is allocated by the Treasury Department to the country in which the services are performed. This means that to be sure of compliance, the design work as well as the supervision should be done on foreign Western Hemisphere soil.

Sign It Abroad

Usually, there is a formal contract between the client and the engineer, drawn up and signed at the time the client agrees to use the engineer's services. It would be prudent for an engineer to have the contract signed on foreign soil rather than in this country.

For example, suppose that a Brazilian manufacturer wanted you to design and supervise construction of a building in Rio. He has come up here to discuss this with you. All is agreed, and you are willing to take the job. Do not sign the contract here in the United States. It might be perfectly all right to, but in view of the lack of court tests, you would

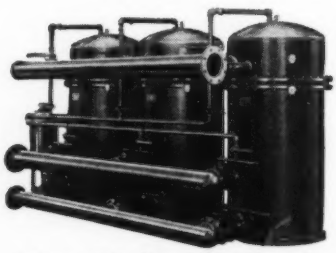


The 621,000 gallons of water in the Mack Community Center swimming pool at Indiana, Pa., can be filtered three times a day — another example of how high capacity Adams filters protect the health of swimmers across the nation.

Here's why the finest pools have R. P. ADAMS SPF filtration!

When you buy Adams filtration for your pool, you get a complete package . . . there's no divided responsibility for performance. Then, the entire system is designed for ease of operation and maintenance. What's more, you get the most advanced filter design offered — using diatomaceous filter aid and permanent Poro-Stone elements. Write for the full details today.

R. P. Adams filters are used to maintain the shimmering clarity of the new Y. W. C. A. pool in Buffalo, New York.



Adams SPF filters are ideal for community pools like that illustrated above. This triple SPF 169 can handle pools up to 730,000 gallons capacity.

R. P. ADAMS CO., Inc.

256 East Park Drive, Buffalo 17, N. Y.

be much smarter to provide in the contract that the entire transaction and the payment of fees take place in Brazil rather than in the United States and that the contract be signed in Brazil. Then, as an extra precaution, if a retainer fee or any sort of preliminary fee is specified, do not accept it in this country but have it paid to an agent in Rio upon the delivery of blueprints or a preliminary report.

Payment Outside U. S.

At least, payment should take place outside the United States and yet in the Western Hemisphere. If it is more convenient, as it probably would be for a firm in Detroit, a permanent office might be set up just across the river in Windsor, Ontario. Then it would be perfectly safe to have all contracts signed, design work done, and payments made in Windsor. The actual projects could be located in Brazil, Chile, or any other foreign country in the Western Hemisphere. An income tax would have to be paid the foreign country, but that, with some limitations, is credited against the firm's U.S. taxes.

The next requirement to be fulfilled is that of "active conduct of a trade or business." There would be no problem here for a consulting engineer who operated his Western Hemisphere Trade Corporation just as he did his partnership or local engineering firm. But it is important that the foreign work actually be done by employees of the Western Hemisphere Trade Corporation and not by the parent engineering firm.

Legitimate Tax Deductions

It is an integral part of our national policy to encourage international commerce. Congress feels that favoring income from foreign sources encourages foreign operations and trade. This feeling has developed into an intricate tax pattern but one that offers substantial advantages to those who can make use of it.

Consulting engineers seem to be in a particularly good position to profit, and there is every reason that they should make use of the law. It must be remembered that all these devices constitute legitimate tax avoidance. They are not loopholes. Congress itself has intentionally appointed the means for the avoidance in order to encourage activities that would seem to be in the best interest of the nation. ▲▲

References

1. CF. 1954 I.R.C. Sections 33 and 801.
2. CF. 1954 I.R.C. Section 941.
3. CF. 1954 I.R.C. Section 931.
4. CF. 1954 I.R.C. Section 911.
5. CF. 1954 I.R.C. Section 902.
6. Revenue Act of 1942: Sections 141 105(b) and 202.
7. Revenue Act of 1950: Section 122(c).
8. 85 Federal (2) 322.

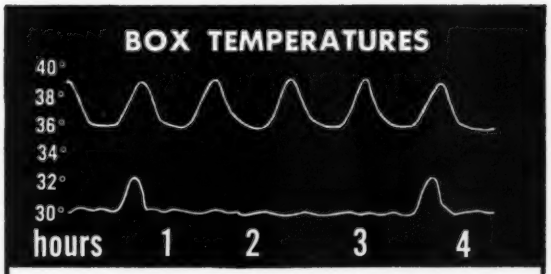
"F" THERMOBANK STORAGE PROBLEMS

equipment must be sized large enough to handle the maximum daily load in 16 hours.

Because the "F" THERMOBANK guarantees rapid and complete defrost, equipment is safely selected for 20 hours operation. This results in the selection of smaller coils and smaller compressor for a 30° "F" THERMOBANK installation than that required for an "off-cycle" system at 35° for the same cooler. Indeed, even at the 34° to 36° level, careful economic comparisons indicate that the "F" THERMOBANK would be a more desirable equipment selection than the old "off-cycle" defrost system for the simple reason that with the "F" THERMOBANK temperature fluctuations can be kept at a minimum; the length of time for defrost can be drastically reduced; and all of this accomplished with possibly lower, but certainly no higher, first cost and certainly no higher operating cost.

The THERMOBANK is time-tested, field tested and has an enviable record of history-making in the low temperature field. The "F" THERMOBANK is enthusiastically recommended for the fresh food range with complete confidence and an assurance of high performance and quality characteristic of Kramer equipment.

The selection and application of the "F" THERMOBANK is as simple as the old "off-cycle" system and has an additional margin of safety in estimating the load because the defrost is positive, complete and rapid. Selection tables covering a wide range of cooler sizes for 30° applications are available.



FIELD TESTS PROVED MARKED ADVANTAGE OF "F" THERMOBANK

Top Curve describes a typical "off-cycle" system: 30 minutes on cycle, 15 minutes "off-cycle". Equipment must be selected for 16 hour operation to obtain defrost. Temperature and humidity conditions continually changing.

Bottom Curve describes a typical "F" THERMOBANK system: 170 minutes refrigeration cycle, 10 minutes defrost cycle. Equipment selected for 20 hour operation. Temperature and humidity practically uniform 'round the clock.

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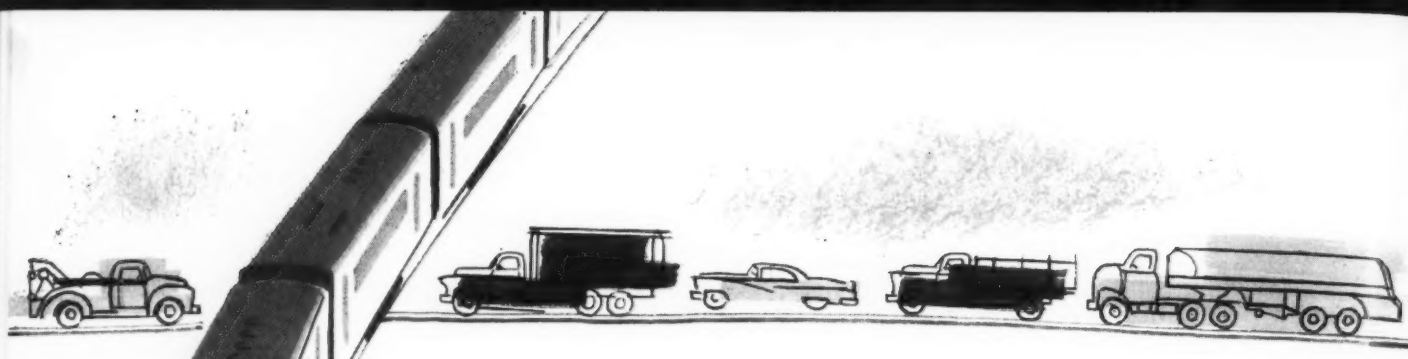


Transportation - - Can We S

C. E. CHILDE, Transportation Consultant, Wash

CE exclusive

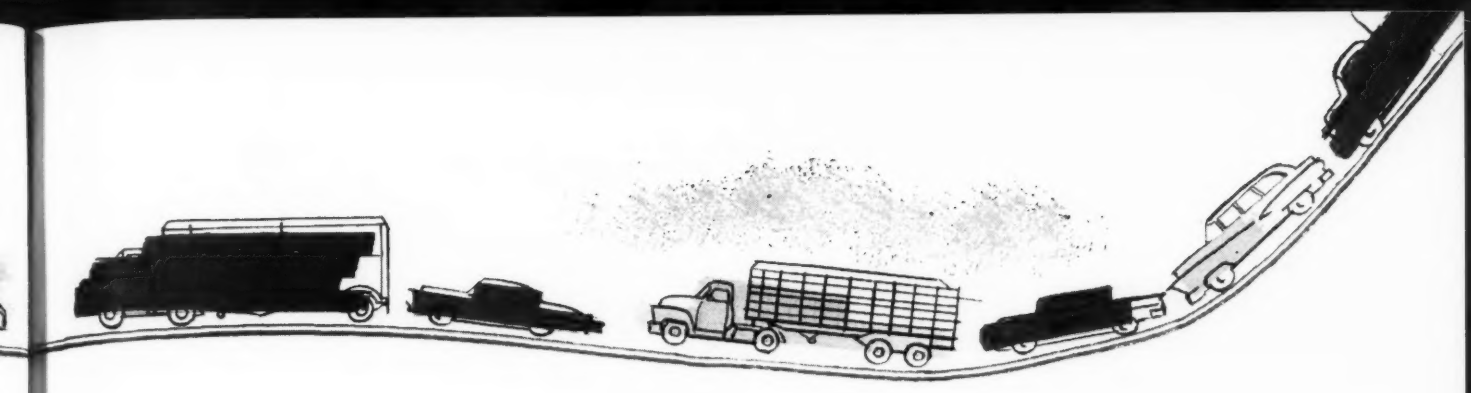
ALTHOUGH AMERICANS now are paying more than $1000 a year — one-fifth of their average annual incomes — for transportation, too little thought is being given to its future, its importance to our national defense, or to the roles of government and private enterprise. Both peacetime and military transportation capacity must be enlarged during the next two decades. Our population is expected to pass the 200 million mark by 1975. This growth alone, without any improvement of living standards, will increase passenger and freight volume about one-fourth. And demand for transport grows faster than population.

In 1939, total intercity freight of 543.5 billion ton-miles equaled 4100 ton-miles per capita; by 1955, ton-miles had increased to 1278 billion, nearly 8000 per capita. Intercity passenger transportation in 1939 was 2100 miles per person; in 1955 this had reached 4000 miles per person. At the present rate of growth, the volume of peacetime transportation by 1975 will be between 50 and 75 percent greater than in 1955.

What will this mean in terms of added rail, highway, water, air, and pipeline facilities? To what extent will government and private interests supply them? And how will the bill be divided between taxpayers, transportation users, and consumers?

The prime essential of war transportation is adequate capacity — cost and convenience are secondary. In peacetime, safety, convenience, economy, capacity, and freedom from unjust discriminations in services and charges are basic. Working out a transportation system suitable for war and peace demands compromise and calls for planning on a comprehensive nationwide scale. This project challenges the best brains available — engineers, economists, politicians, business and transportation executives, and military experts.

Such joining of governmental and private effort never has been undertaken except in great national



Solve its Problems?

Washington, D. C.

Born in Lincoln, Nebraska, July 19, 1887, C. E. Childe's career started as telegrapher and clerk for the Burlington Railroad. Later he was traffic manager of several industries and commercial organizations in Omaha, Nebraska, and Sioux City, Iowa. He opened offices at Omaha, in 1935, as transportation consultant, with clientele of business firms, organizations, carriers, and public agencies throughout the Mississippi Valley. In 1941-1944 he served as member of the Federal Transportation Board of Investigation and Research, to report to the President and Congress on the economy and fitness of the country's transportation agencies and the methods which should be adopted to provide a national transportation system adequate for commerce and national defense. Since 1944 he has been a transportation consultant, in Washington, for private clients and for Federal agencies, among them the U. S. Senate Small Business Committee, U. S. Corps of Army Engineers, Department of Agriculture, Department of Commerce, and the President's Water Resources Policy Commission. He is a past president of the National Industrial Traffic League and a past member of the Executive Board of the National Highway Users Conference. He belongs to the Cosmos Club and the Torch Club in Washington, D. C.

emergency. The very idea of calling the government into fields of private enterprise is distasteful to our common thinking. Are we prepared to go into such planning, and what are the alternatives?

Merchant vessels, and shipyards to build and maintain them, are essential for national defense and foreign commerce. Coastal and Great Lakes ships, and inland waterway barges, meet needs for low-cost bulk transportation. Water is by far the cheapest medium for moving bulk freight. Package-freight costs by water are relatively high, but that is because of the loading and unloading costs. This is being overcome by modern container ships, which carry loaded truck bodies and rail cars which are not unloaded until the destination is reached.

During the last war, the government built a huge fleet of ocean ships, changing the United States from a minor to a major maritime nation. These vessels are the bulk of the present merchant vessels flying the United States flag. Many were sold or chartered to United States operators. Others were sold abroad. Some of the slower vessels are held idle in reserve by the government.

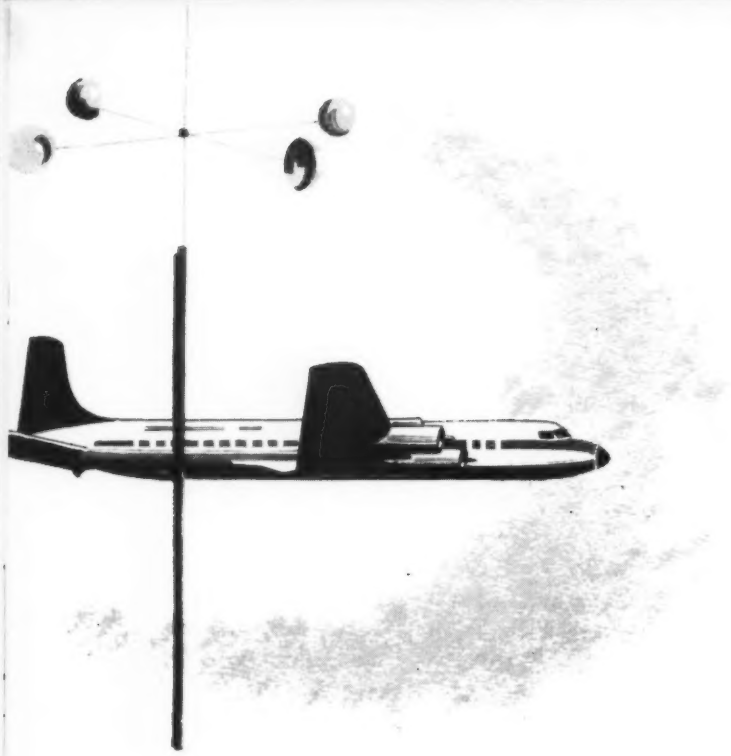
Shipping Subsidies

United States vessels must compete in foreign trade with ships of other nations whose construction and operating costs are much lower. The government subsidizes a limited number of operators on essential trade routes by payments to equalize cost differences. The type and number of ships, sailings, and routes are specified. Rates are subject to government regulation. U.S. vessels also derive substantial benefits from preferential routing of military and relief freight.

No subsidies are allowed to tramps or irregular operators carrying bulk cargo, which is the major part of our foreign commerce. The result is that most of our bulk cargo is carried in lower-cost foreign ships. In event of war, our ocean fleet could supply only a fraction of our shipping needs. The fleet would have to be supplemented, as it has been in the past, by new construction and by requisitioning for ocean service ships from our coastal and intercoastal trades.

Coastal, intercoastal, noncontiguous domestic ocean, and inland water commerce is confined by law to U.S. vessels and operators. No subsidies are paid although river and harbor maintenance is provided by the Army Corps of Engineers. General cargo carriers can operate only if the government finds their services are required as a public convenience and necessity.

Rates, except on bulk cargoes, are government-regulated. However, bulk tonnage, including that in vessels belonging to the owners of the freight, constitutes the great preponderance of inland and coastal water commerce. The regulated inland and coast-



al carriers compete with overland services of railroads and motor carriers, which also are federal government-regulated.

The railroads still are our largest overland carriers. Although they have lost their former virtual monopoly of land transportation, the railroads nevertheless have had a tremendous growth of traffic placing them well in the lead of "for-hire" freight and passenger carriers. Their dominance, at least in freight carriage, promises to continue.

From 1939 to 1955, railroad freight ton-miles almost doubled — from 339 billion in 1939 to 631 billion in 1955. Rail ton-mileage in 1955 was more than 40 percent greater than intercity motor and inland water traffic combined. Even passenger traffic, which has been a minor and unprofitable part of railroad operations, increased from 24-billion passenger-miles in 1939 to 29 billion in 1955.

Cost Comparisons

The phenomenal growth of highway, inland waterway, pipeline, and air transportation during the past three decades is well known. The private automobile provided the impetus for the construction of 2-million miles of hard-surface roads throughout the nation. The present investment in highways and streets exceeds $50 billion, and another $50-billion program for their improvement now is under way. Whether the special taxes paid by commercial vehicles fully pay for their use of the highways is a matter of hot dispute between the railroads and motor carriers. The railroads' investment in their private rights-of-way is something over $17 billion.

The railroads haul heavy carloads cheaper than trucks but on light loads (especially less-than-carload quantities) trucks are more economical. Motor transportation of property and passengers has the advantage over railroads of moving beyond points railroads can reach, at faster over-all speed. Freight also moves more safely by truck than by train, and frequently at savings in packing costs. All things considered, motor transportation, for many commodities and hauls, may be inherently cheaper than rail although the cost of moving heavily-loaded trains from terminal to terminal is much lower per unit of carrying capacity than motor vehicle transport.

Water Transport

Rail transport also has a cost advantage over conventional cargo vessels for carrying carload lots of packaged freight, but carloads and truckloads can be carried on container ships cheaper than by rail. Bulk freight is carried much cheaper by ships and barges than by land carriers, and coastal transport is about as fast as rail.

Domestic water transport is more complementary than competitive to rail and truck lines, but there is active competition between the land and water carriers for some kinds of traffic.

Since the first World War, Congress has appropriated about $2 billion for a greatly enlarged system of connected river canal and Great Lakes waterways. While inland barge transportation requires shipment in large units, its advantage is that it is cheaper for moving heavy bulk freight. This is an important con-

sideration to heavy industry, which tends to locate where the cheapest transportation is available, and to farmers and extractive industries seeking profitable markets.

Each Has Advantages

Pipelines are classed as common carriers, but they are virtually private facilities built by and for large refineries and gas producers, moving their crude and refined products at much lower than railroad costs.

Air transport offers speed and flexibility. For first-class passengers, mail, and a limited variety of freight, the airlines may offer greater over-all economy than land carriers.

Passenger transportation costs of the railroads are much higher than for buses and, for first-class passengers, higher than airlines. In the postwar years, the railroads' passenger expenses have resulted in great losses which were absorbed out of freight revenues, jeopardizing the railroads' ability to compete for freight.

Passenger train losses, as computed by the Interstate Commerce Commission, recently have been more than half a billion dollars a year. A portion of this consisted of losses which should be shared between freight and passenger operations. Studies now are under way to see how much is attributable directly to passenger costs.

Each form of transport has its advantages, but the only way these advantages can be passed along to the public is in the form of rates which fairly reflect the cost of each service. Unfortunately, rates and charges have become fixed by custom, competition, and regulation into patterns which bear little or no resemblance to the actual cost of the service.

R.R. Rate Structure

Railroad rates and services have been subject to state and federal regulation for three-quarters of a century. However, the basic questions of what constitutes an economically sound and fair rate structure, and how much freedom the railroads should have in managing their properties and setting the prices for their services still are far from settled.

From the beginning, railroads have charged "what the traffic will bear," rather than relating rates to service costs. Theoretically, the out-of-pocket cost, plus some profit, was considered to be the lowest a rate would go. Actually, many rates were and still are lower than out-of-pocket costs.

At the other extreme, rates went to heights limited only by the ability of the traffic to pay. Of course, high rates may reduce traffic without destroying it. In that event, the carrier's problem is to fix a rate that — volume of traffic considered — yields the highest revenue. Whether the users' costs shall be based on what the carrier considers the traffic will bear or on the carrier's cost-plus-profit, is the heart of the country's problem of how to get the best transportation service at the lowest cost without unfair discriminations against one shipper over another.

Drastic inequalities in railroad rates resulting from the "what-the-traffic-will-bear" theory were the principal reason for the enactment of regulatory laws. The paramount objective of the Act to Regulate Commerce, passed in 1887, and its later amendments, was to do away with every form of discrimination. However, this purpose never was attained because of interpretations of the Act by the Interstate Commerce Commission and the courts. It was concluded that rates reasonably may be set in relation to "the value of the service" as well as to the cost and that rate discriminations were not unlawful, under the terms of the statute, if they grew out of differences in competition the carrier had to meet. Thus the door was flung wide open, and still remains open, to wide variations in railroad rates. This system of rate-making has been especially injurious to small shippers and communities in the less highly developed areas who pay relatively higher rates because of less intense competition between carriers for their freight shipments.

Rate Increases

A second phase of regulatory policy came during and after World War I, when the railroads were unable to cope with suddenly increased traffic demands and had to be operated by the federal government as a single national system. Wages and rates were increased drastically and maintenance decreased.

At the war's end, another large rate increase was granted, and the Interstate Commerce Commission

was directed to maintain rates high enough to insure a fair over-all return on the value of the properties. The railroads enjoyed unprecedented prosperity in the 1920's. During the 1930's, rail rate levels, contrary to general price trends, remained substantially at or above the levels of the 1920's, and thus gave added incentive to rising highway and water transportation competition. The Interstate Commerce Commission, mindful of its duty to foster rail revenues, allowed some temporary general increases, and in 1938 granted an over-all increase of about 10 percent. But traffic volume and revenues sharply decreased because of the business depression and because of the growth of other forms of transportation which undercut the rail rates.

Post-War Rates

The Second World War brought record traffic volume and prosperity to the railroads. Then after the war came the end of commodity price controls and onset of wage increases. Since the end of World War II, the Interstate Commerce Commission has allowed seven interim and five permanent general rate increases, to about double the levels of the 1920-30's, and now is in the process of granting another. As the law stands, the procedure is practically automatic — each showing of increased expenses is followed by a general rate raise.

There is, however, one important variation. The railroads are left free, and even are encouraged, to propose lesser increases, or reductions, on traffic highly competitive with other forms of transportation. This policy is leading to wide differences in rates charged on different commodities or on the same commodity shipped from or to different points — in disregard of the cost of the service and competitive relations among shippers.

Not Based on Costs

Recent Commission studies show that of 257 classes of commodities reported by the railroads, the rates of 41 classes average below out-of-pocket cost, and only 171 classes pay any margin above the full cost. The average rate levels, by commodity classes ranged from 591 percent above to 89 percent below out-of-pocket costs. One wonders that either management or government permits such inept pricing; the responsibility is primarily management's.

It is this situation, and the fear that the railroads will be permitted to make even wider departures from cost in future rate readjustments, that underlies the opposition of other carriers and many shippers to giving the railroads greater leeway than they now have to meet competitive rates.

The Interstate Commerce Commission's task of regulating competitive types of carriers offering diverse services at widely varying costs has been confusing and unsatisfactory to most interests concerned. Committed as the Commission is to preserving railroad revenues and a rail rate structure based on what-the-traffic-will-bear, it has tended to fix motor carrier's rates on rail rate patterns rather than on trucking costs.

At the same time, the Commission has permitted railroads to reduce individual rates to avoid losing traffic to motor or water transportation. Supposedly, such reductions are not to go below out-of-pocket cost, or below a point which would unduly injure or destroy the competition. The motor and water carriers also are restrained from reducing their rates below a competitive point. But there remains, as a constant concern of the Commission and the regulated carriers, transportation by private and unregulated highway and water carriers whose rates must be considered where they undercut regulated transportation agencies. Certainly the present rate policies of the carriers and the government fall considerably short of regulation "to preserve the inherent advantages" of each mode of transportation. About the most than can be said of the Commission's present policy is that it tries to give everyone some share of the traffic.

Regulated Competitors

Endless controversies arise between the competing regulated rail, motor, and water carriers as to whether they are treated fairly in their competition among themselves and with unregulated carriers. The railroads complain that their competitors are given free, government-built rights-of-way, that they are under-taxed for their use, and that the Interstate Commerce Commission is slow and parsimonious both in allowing rate increases and in permitting individual competitive rail rate reductions.

The motor carriers, on the other hand, insist that their special taxes more than compensate for their use of public highways.

Inland water carriers say that user taxes would increase their costs and that rail carriers could destroy their business if they were not restrained from making below-cost competitive rates.

The motor and water carriers both contend that the Commission is over-liberal to the railroads in fixing competitive rates to allow the railroads more than a fair share of the traffic.

The Forgotten Shipper

In this turmoil, the voices of shippers are heard weakly. Some complain of rising transportation costs, others of harmful effects of discriminatory rates. But the business boom softens the impact of these burdens. When a recession comes, the chorus may become loud enough to be heard in the halls of Congress, as it was in the days when anti-discrimination laws originally were enacted.

Currently, the railroads are pressing the Administration and Congress for legislation to loosen In-

terstate Commerce Commission control so they can raise or lower rates more freely as they consider necessary to improve their earnings and meet competition. Their proposals were embodied in a report made to President Eisenhower, in 1955, by members of the Cabinet. The President has recommended favorable Congressional action on the proposals.

Committee's Recommendations

The essence of the Cabinet Committee's recommendations is that privately owned and operated common carrier transportation — especially railroad transportation — is necessary to the country's welfare and must be encouraged, but that the present system of public subsidization and regulation unduly restricts common carrier competition and encourages the growth of unregulated or lightly regulated carriers. The Committee proposes that the present declaration of national transportation policy, calling for regulation "to preserve the inherent advantages" of each mode of transportation, be repealed.

The suggested substitute is a policy of "dynamic competition," in which regulation of noncommon carriers would be stiffened, but railroads and other regulated common carriers would be given freedom to charge rates subject only to mild general provisions against arbitrary discriminations or charging rates below out-of-pocket costs.

The railroads support the Committee's proposals, but they are being fought bitterly by the regulated motor and inland water carriers, contract and private carriers, farm organizations, and many shippers. The Interstate Commerce Commission opposes the proposals. Some large industrial and financial groups support them in principle. The opposition principally is based on the belief that ruinous competition between the railroads and other carriers would ensue. It is felt that intolerable rate discriminations between shippers and localities, and eventual breakdown of efficient and economical services, would result.

A Change is Needed

If the railroads were given unrestrained opportunity to follow the what-the-traffic-will-bear policy, they probably could increase enough noncompetitive rates and reduce enough competitive rates to cripple or destroy many of the other carriers. Whether such practices could continue long, without also crippling or bankrupting many railroads, is questionable. It is doubtful that the country would endure the harmful effects to industry of having lower rates extended to one shipper for substantially the same services as another receives for higher rates.

If every carrier were to complete for traffic on rates based on cost, with ample margin of profit allowed for the most efficient services, traffic automatically would be attracted to the most economical and efficient service. Under a policy of basing rates on costs, carriers using government-provided facilities could and should pay reasonable user taxes or fees.

Advocates of the what-the-traffic-will-bear policy fear that the railroads, under private ownership, cannot successfully meet competition if rates for each service are based on cost. It is true that average rail profits are low, expenses are rising, and other forms of transport are growing rapidly. It also is true that rail rates sadly need revamping to avoid the large losses they now incur by below-cost hauling of freight that other carriers can handle at a profit. Railroads also haul some freight at needlessly low rates simply through custom, yet maintain some rates so high that other items needlessly are kept off the rails. Students of transportation agree that the railroads have fallen into many other wasteful practices.

By revamping and coordinating operations and revising rates and tariffs, the railroads could save $2 billion annually, and — at the same time — greatly improve services. This, rather than destructive rate wars, seems to be the railroad's solution. Of course, there also are possibilities of improving the services of other carriers. Coordinating services of the several types could benefit each as well as the public.

Clearly, the policies to be adopted by the government as to rates and competition of existing carriers will decisively influence the growth of each type of transport, and the kind of national transportation system we will have in the future. Decisions on these policies must be reached before intelligent action can be taken, as to what enlargements will be desirable and profitable by governmental and private interests, and what provisions should be made for defense and peacetime needs.

What is Needed

Considering all interests involved, it appears that attainment and enjoyment of an adequate national transportation system requires:

¶ Comprehensive study and planning, of a continuing nature, in which the best talents of qualified governmental, professional, and business agencies cooperate.

¶ Governmental provision of adequate waterways, airways, and highways, with reasonable use charges. The government should assume extraordinary expenses for defense purposes.

¶ Continuation of government subsidies of United States vessels in foreign trade, and domestic and international airlines, only to the extent necessary for national security and commerce.

¶ Private operation of carriers under governmental regulation promoting efficiency and economy based on healthy competition, with rates founded on cost-of-service, and provisions insuring fair and equal treatment of shippers. ▲▲

"The Corporate structure is not a way out of individual responsibility - - instead it offers a way of fulfilling it."

L. J. SVERDRUP
Sverdrup & Parcel

Why We Favor Corporate Practice

HAVING BEEN ENGAGED in the practice of the profession for approximately 30 years as senior member of a partnership and for a lesser number of years as president of a corporation offering the services of professional engineers and architects, I feel that I have some background for concluding that there are both business and professional benefits that can result from the practice of engineering by professional engineers whose services are offered through corporations formed for that purpose.

CE exclusive

Public Practice

I am not concerned with presenting evidence in defense of the practice of engineering by contracting and manufacturing corporations. I do feel, however, that we who are engaged in what Mr. O'Donnell has designated as "public practice"* should not dismiss the engineers who are employed in those organizations as merely "one of the several elements in the final product of an enterprise." Often these engineers are as responsible to the public as any of us who are engaged in "public practice." Many of the executives and engineers employed by our larger corporations are esteemed members of our profession. Their companies are required to stand behind the engineering design of their product, and the manufacture and inspection of these products are under close engineering control.

Engineers In Industry

Are not the men so engaged responsible for safeguarding "life, health, and property?" They certainly are eligible for registration as professional engineers under all state laws, and their licenses may be revoked for cause. Insofar as financial protection for the public is concerned, it is quite possible that the public is protected more fully by the resources of such a corporation than by the resources of the individual engaged in "public practice" — but it is not intended that this be a defense of our fellow engineers engaged in construction and manufactur-

*"Engineers Should Know Why We Oppose Corporate Practice," James P. O'Donnell, CONSULTING ENGINEER, Feb. 1957.

ing fields. It is intended, rather, as a presentation of the corporation as a desirable instrument for offering the services of professional engineers and architects to the advantage of the public and the engineers and architects employed by the corporation, whether they be stockholders or not.

The Professional Concept

No fair-minded person can find fault with the idea that it is inherent in the practice of the learned professions that the rendering of service to the public be based on the competence and integrity of the individual practitioner and that individual responsibility must be assumed by him. Issue can be taken, however, with the premise that these characteristics cannot be complied with through a corporation and that the principal feature of a corporation is necessarily "the avoidance of individual responsibility."

There is no intent here to suggest that professional services should be offered by any corporation regardless of ownership or management. In my opinion, control of the corporation should be in the hands of registered engineers, or registered engineers and architects if both types of services are offered. This does not preclude stock being held by the wives of the professional men involved if that ownership is desirable for estate purposes, nor does it prevent minority holdings by legal, fiscal, or other administrative experts who are employees of the corporation and they contribute to its successful operation. The principal officer, however, and a majority of all officers and directors certainly should be professional engineers or architects actively engaged in the operation of the organization. These professional people are then fully as responsible to their clients for their actions as is the individual practitioner or a member of a partnership. If their professional licenses are revoked, the corporation — under the requirements outlined — is in no position to function, for its ownership and management no longer would be in control of licensed professional engineers.

Individual Responsibility

Actually, the idea that a corporation can continue to exist and continue to contract to supply professional services without regard to the integrity and competence of its professional employees is something of a myth. The clients whom we serve, whether we contract with them as individuals, partners or corporate officers, look to us to provide the professional services they have a right to expect. The client may contract with a corporation, but he holds the individual engineer-owner responsible for his actions as surely as he would under any other contractual relationship.

And what of the financial responsibility to the client? There is a good possibility that the corporation will be better able to meet its obligation than either an individual or partnership having substantially the same annual income.

Legislative and Judicial Actions

Laws are created by legislative action and interpreted by the courts. Engineers in general are not qualified lawyers, and it is not intended that this be a defense of the right of corporations to offer professional services in violation of any court decision or in any state where by legislative action the offering of corporate services is prohibited. Many of the adverse court decisions have resulted from an attempt to offer services where the law clearly forbids it; others have resulted from attempts by corporations to force a registration board to grant them a license to practice professional engineering.

It is almost self-evident that only a "natural" person can be qualified to practice engineering, medicine, the law, or any other profession, and hence no corporation can be licensed to practice a profession. On the other hand, it seems unreasonable that engineers should deprive themselves of the right to band together and avail themselves of the advantages that may accrue from contracting as a corporation. Let it be understood that we refer to a corporation having the legal right to offer the services of professional engineers and architects and not a corporation licensed to practice these professions. No action by any court to declare invalid a law allowing corporations to offer such services has come to my attention.

So Why a Corporation?

Engineering orginally was practiced by individuals who had reached such eminence that their services were sought by others on an advisory basis — consultants in the strictest sense. If they had any employees they were likely to be young men who were serving in a capacity that can only be called apprenticeship. Relatively few members of the profession still practice on this kind of personal basis. As the complexity of projects and the knowledge of engineering principles increased, it became necessary for the individual to augment his knowledge and his capability for production by adding to his staff qualified engineering and drafting personnel.

It often seemed desirable to broaden knowledge and financial resources and responsibilities by combining with other engineers, and perhaps with architects, into a partnership.

In recent years the size and complexity of engineering projects has increased at an unprecedented rate, and the profession has been called upon to develop organizations of unprecedented size and capabilities. There is no contention that projects of great magnitude cannot be handled by individuals, partnerships, or combinations of partnerships or individuals, but it is true that many clients — with considerable logic — demand that they contract with

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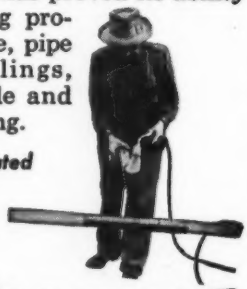
When you are faced with the problem of protecting piping underground in highly corrosive soils, a high quality coal tar coating such as called for in AWWA Specifications C-203 and C-204 is normally hot applied at a pipe coating mill. However, in many cases, the volume of pipe does not warrant this expense or the coating mill is too far away to justify the time involved.

That's WHEN Engineers Specify TAPECOAT . . . the practical alternate hot-applied coal tar coating in handy tape form

Because TAPECOAT provides a coal tar coating equivalent in long-life protection to hot-applied coating at the mill, engineers are specifying this quality alternate material where time and cost factors preclude mill application.

This practical solution assures the protection required without the need for tar kettles, technical know-how and special crews. Field application costs are reduced because TAPECOAT is so easy to apply, using a torch to soften or bleed the pitch and then spirally wrapping it on the vulnerable surface.

TAPECOAT comes in handy rolls of 2″, 3″, 4″, 6″, 18″ and 24″ widths. Since 1941, it has proved its ability to give lasting protection to pipe, pipe joints, couplings, conduit, cable and insulated piping.



Write for illustrated brochure.

The* TAPECOAT *Company

Originators of Coal Tar Coating in Tape Form

1569 Lyons Street
Evanston, Illinois

a single entity and that the work be performed by one integrated organization. We then find our engineer or group of professional-owners faced with a sizeable job of financing an organization whose cost may run into millions of dollars annually. They also have the responsibility of providing financial security not only for themselves but for a large group of fellow professionals who are as intimately related to the firm's professional activities as are the principals.

A partnership has certain obvious disadvantages from a business standpoint. With present high income tax rates and with the necessity of paying taxes on profits at the rates applicable to the individual partners, it has been increasingly difficult for a partnership to accumulate capital to provide the necessary security. Another disadvantage is that under the laws of many states, a partnership is automatically dissolved on the death of any partner and a distribution of assets is required. This necessitates the formation of a new partnership to carry on the business, and it may find itself burdened with serious financial problems.

The corporation presents itself as a solution for all concerned, and it need not affect professional attitudes one iota. Instead of providing a way out of individual responsibility it offers a way of fulfilling it.

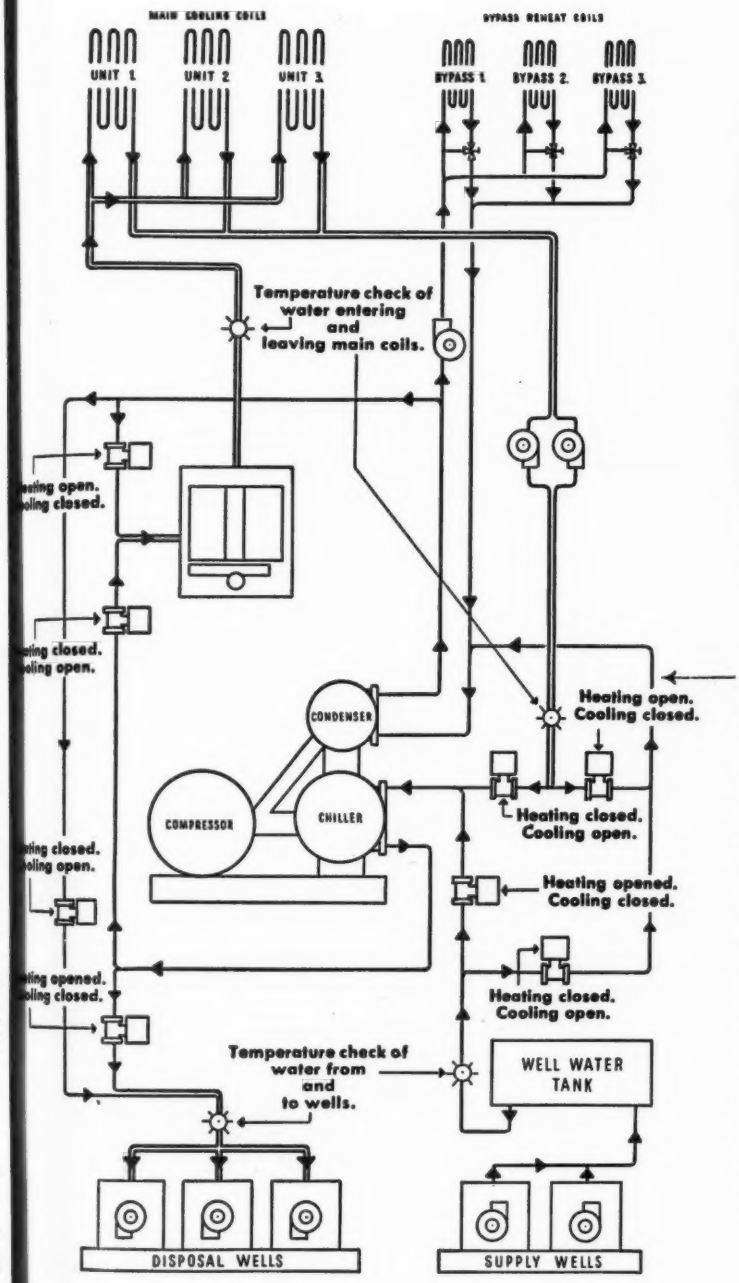
Practice through such a corporation actually may result in a financial disadvantage to the principals when compared to a partnership, for the corporation must pay corporate taxes on all net income, and the principals then must pay personal taxes on any income they take from these profits. However, it may provide a means for accumulating more funds in the business to carry fellow professionals employed by the corporation through periods when income is at a low level. It also may provide a means for creating a pension and insurance fund for the principals as well as for the fellow employees of the corporation. Should it become necessary to borrow funds to finance the operations of the organization, it is quite likely that the banker will look more favorably on lending to a corporation whose assets are readily determined than to an individual or several individuals whose personal financial status may be less obvious.

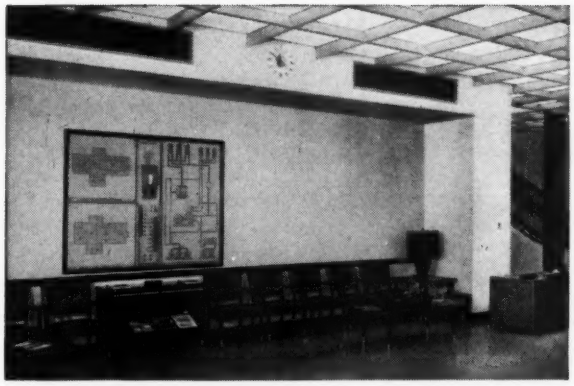
And what of responsibility to the client? While engineers have maintained that their responsibility is to provide professional services on a "best efforts" basis, recent actions by the courts seem to be contrary to this theory. There seems to be a growing tendency to assess damages against practicing engineers for errors and omissions when action is brought by clients. Then the corporation presents a more responsible agent than the individual for fulfilling the obligations imposed. It is fully as liable as a natural person and to the full extent of its resources; these resources are readily determinable and, in view of the tax situation, they should be more than those of an individual or a partnership.

A Business Method

So why corporate practice with proper legislative safeguards? Certainly not for the avoidance of individual responsibility and not for personal gain of the principals at the expense of their clients, fellow professionals, or the public. It is instead a businesslike method for operating a professional organization to provide security for those depending on it for a livelihood and those doing business with it as clients.

All practicing engineers should have the right to choose the type of business structure under which they desire to operate. But they should not deprive themselves or be deprived of a corporate structure if it provides advantages and security for themselves, their associates, their clients, and the public. ▲▲





New use for electric power—heating and cooling with a heat pump—is demonstrated dramatically by prominent display of the Supervisory DataCenter control panel in the lobby of the Tampa Electric Company building.

Heat pump operation. Tampa Electric Company heat pump system has three water circuits. (1) A circuit from the supply wells through the chiller (heating cycle) or condenser (cooling cycle) to the disposal wells. (2) A closed circuit from the main cooling coil to the condenser (heating cycle) or the chiller (cooling cycle). (3) A circuit from the condenser (cooling cycle) to the bypass reheat coils. During cooling cycle, water from the wells passes through condenser where it picks up heat. This warmer water then returns to the disposal wells. Water from main cooling coils is cooled by the chiller in a closed loop. During heating cycle, water from the wells gives up heat in the chiller and this cooler water is returned to the disposal wells. Water from the main coils is heated by the condenser in a closed loop. The difference in the temperature of the water entering and leaving the main cooling coils is a measurement of the heat being removed or added to the circulated air. The difference in the temperature of the water leaving and returning to the wells is a measurement of the amount of heat being removed from or added to the well water. The output of the compressor is controlled by a Honeywell miniature indicating-controller to maintain a temperature of 45° for cooling and 105° for heating of the supply water for the well coils. For further explanation of system operation, refer to notes on diagram at left.

..with Honeywell Supervisory DataCenter

Greater operating efficiency with less personnel time . . . longer equipment life . . . operational savings that liquidate cost . . . attractive display of your engineering design—all this can be accomplished with the centralization made possible by the Honeywell Supervisory DataCenter. More than 100 of these installations are now in operation throughout the country.

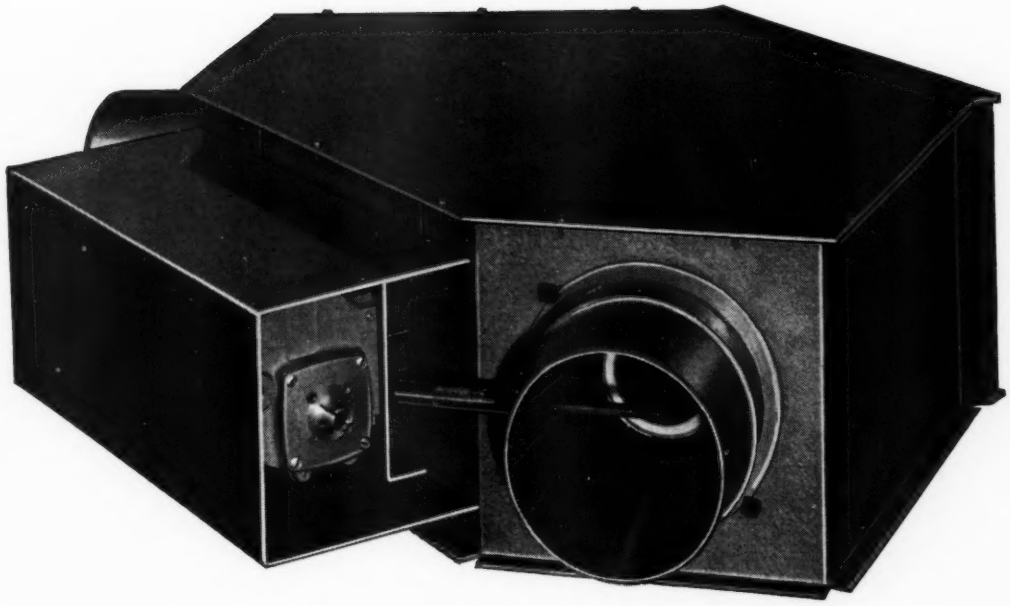
All components of the DataCenter are manufactured by Honeywell. And *only* Honeywell manufactures pneumatic, electric and electronic controls and instruments.

For further information about the DataCenter and other Honeywell control concepts, call your local Honeywell office. Or if you prefer, write to Minneapolis-Honeywell, Dept. CO-6-143, Minneapolis 8, Minnesota.

For news about another major Honeywell contribution to air conditioning, turn the page.——→

Control leadership through advanced engineering-research

Dial adjusted only once—when you uncrate blender or at time of installation—room thermostat takes over from then on. Calibrated dial air balancing is the key to the superior performance of the Honeywell High Velocity Air Blender. It consists of simple adjustments of internal blender components. Once balanced, control is in the hands of the system thermostats. And it stays there—giving your clients the kind of comfort they like to have.



How blender works. This is the packaged blender for conventional installation. Other configurations available for special installations. From it, whatever the form, you and your clients can expect controlled volume of air, constant CFM, long valve life and simplified control. The thermostat in the Air Blender System controls temperature by controlling the volume of hot air passed by the hot duct. At the same time a flow regulator provides a constant hot air volume for a given thermostat signal under variations in supply duct pressures. A constant total flow is provided by a total flow regulator which operates the cold air valve to make up the difference between hot flow and desired total flow.

al Air Balancing

New Honeywell Air Blender Solves Dual-Duct High Velocity Distribution Problems

Provides constant delivered air volume, needs no recalibration when you add to system

WITH THE new Honeywell Air Blender your clients get the level of comfort they want —on the simple call of the room thermostat.

They get this easily, because the Honeywell Air Blender combines temperature and volume control in one unit.

And comfort doesn't come at the expense of some other room. It comes from the system. *One room no longer "robs" another of comfort.*

Besides providing constant delivered air volume, the Honeywell Air Blender takes well to change. With Dial Air Balancing you can add to the system without having to recalibrate distribution points that may be scattered widely—especially valuable in floor by floor modernization or on new construction.

Self-powered, the Honeywell Air Blender uses the air pressure of the high velocity air it is controlling to actuate the diaphragm—its only moving part. Such simplicity makes possible long life and trouble free performance.

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Only Honeywell gives you all four— pneumatic, electric, electronic, instruments.

Room thermostat—
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The "new" look in thermostats that's appearing on walls of commercial buildings throughout America. New design *inside* gives closer control, vastly superior performance.

THE COUNCIL MEETS IN MINNEAPOLIS. BOARD MEMBERS ARE SEATED AROUND TABLE; OBSERVERS ARE STANDING.

C.E.C. Holds First Annual Meeting

STAFF REPORT

IT IS FORTUNATE that the character of a city resides more in its people than in its buildings and streets. Otherwise, few of the engineers who attended the First Annual Meeting of the Consulting Engineers Council would have had any way of knowing they had been in Minneapolis. Few had time to leave the hotel. But the members of the Minnesota Association of Consulting Engineers were such excellent hosts that on any return visit the delegates would recognize Minneapolis by its hospitality if not by its skyline.

This was a working meeting. The executive committee of the Council had been in session for three days before the Annual Meeting began on May 3. During these pre-meeting sessions they had prepared an agenda and correlated the reports of the committees so that when the directors got to work as a group, the way was well laid out for them.

Committee Reports

The first important business of the Council was to hear a report of the membership committee. Hueston M. Smith, of St. Louis, chairman of the committee told the directors that he had applications from four associations who wished to become members of the Council — Illinois, New Mexico, Texas (Dallas-Ft. Worth), and Washington. Representatives of all except Texas were present at the meeting, ready to take their places at the directors table, while Texas with no delegates present, had applied for membership by wire. These four groups were accepted as members of the Council, bringing the total association membership to seventeen.

Smith continued his report by stating that there is now an active group in Iowa, which probably plans to apply for admission to the Council at its next meeting in the fall, and there is also a group in Cincinnati, that has been functioning for several months. Both of these groups had observers at the meeting — Robert Rosene, representing Iowa; and Al F. Ruehlmann, representing Cincinnati. There was another observer, Earle M. Rader, of Miami, Florida. While there is no active association in Florida, Mr. Rader was in Minneapolis to see how the Council operated and thereafter to report back to a number of consulting engineers in Florida who are considering the formation of a state association.

Smith also reported that Michigan consulting engineers had held an organizational meeting in Lansing, on April 27, and had voted for organization of a Michigan Association and had voted to affiliate that group with the Council at the earliest possible moment. There is also indication of activity in a number of other states.

Errors & Omissions Insurance

The professional committee has had the investigation of errors and omissions insurance as one of its primary jobs. Barney Dornblatt, chairman of the committee, reported that he had investigated the possibilities for group insurance for members of the associations affiliated with the council, and he recommended that the Council sponsor a Lloyds of London policy being made available through H. C. Hauth & Company, of New York.

The committee had found that only one American company, Continental Casualty, of Chicago, is of-

fering a group policy. The American Institute of Architects and the National Society of Professional Engineers are both dealing with that company. On the other hand, the American Institute of Consulting Engineers and the New York Association of Consulting Engineers each have group policies under Lloyds. Mr. Dornblatt recommended the Lloyds policy principally because many consulting engineers already carry Lloyds policies, which could easily be brought under the group arrangement; H. C. Hauth has had more experience than any other American agent in administering E & O policies; and the Lloyds policy is available in all states while the Continental Casualty policy is not yet available in Louisiana, New Jersey, Virginia, or Montana.

The Board accepted the report of the committee, and the H. C. Hauth Company was asked to issue policies to those members of affiliated associations who might want them under a group arrangement. The savings on premiums will be considerable with group coverage, but the amount of the savings will depend on how many of the firms avail themselves of this opportunity. The more participants the lower the premiums.

Employees and the Highway Program

The professional committee then called to the attention of the board of directors a ruling of the Public Roads Administration that, in effect, prohibits any consulting engineer who has a contract under the Federal Highway Act of 1956 from hiring any employee of any federal, state, or local highway department. It was recognized that the intent of the directive was merely to prevent pirating of employees, but the actual result would be to chain highway department employees to their jobs and eliminate any possibility of a free labor market. The board expressed the feeling that the ruling was unfair to engineering employees of highway departments and consulting engineers, and a resolution was adopted objecting to the ruling. The board asked that a copy of the resolution be presented by the president of the Council to the Commissioner of Public Roads and the Secretary of Commerce. It is hoped that as a result of these efforts, and the efforts of several other engineering societies, the Public Roads Administration can be shown the errors of their ways and, in turn, revise their ruling.

Publicity Committee Report

Charles Pate, chairman of the publicity committee presented the board with a written report covering the work completed by his committee and the program planned for the year ahead. The committee has been publishing, from time to time, a newsletter designed to keep all association members aware of activities in other regions. During the past year this newsletter has been published by the chairman of the publicity committee through his own office facilities. Pate reported that while this had been a satisfactory temporary arrangement, the publication could serve its purpose adequately only if turned over to an information director for publication as a part of the Council's regular office operations.

The committee further reported that publicity in the form of a national program aimed at prospective clients cannot be carried on successfully unless the message is given sufficient coverage and is repeated often enough to take full effect. Such a program, the committee thought, would cost at least $50,000 a year, and on the Council's current budget this would be impossible. It should be kept in mind, however, as a goal for some future year.

In the meantime, the committee has had considerable success in its modest efforts to fight "free engineering" as offered in the advertising of some manufacturers. The campaign has moved in two directions. The committee has complimented, on one hand, those manufacturers who in their advertising have called attention to the consulting engineer or recognized his proper position as a designer and specifier. Conversely, the committee has written to several manufacturers who have offered "free engineering" through their advertising and has asked them to respect the registration laws of the states and the position of the consulting engineer in the client-consultant-manufacturer relationship.

The committee pointed out that this work is most important and requires considerable time. The chairman asked that a director be appointed to handle this work.

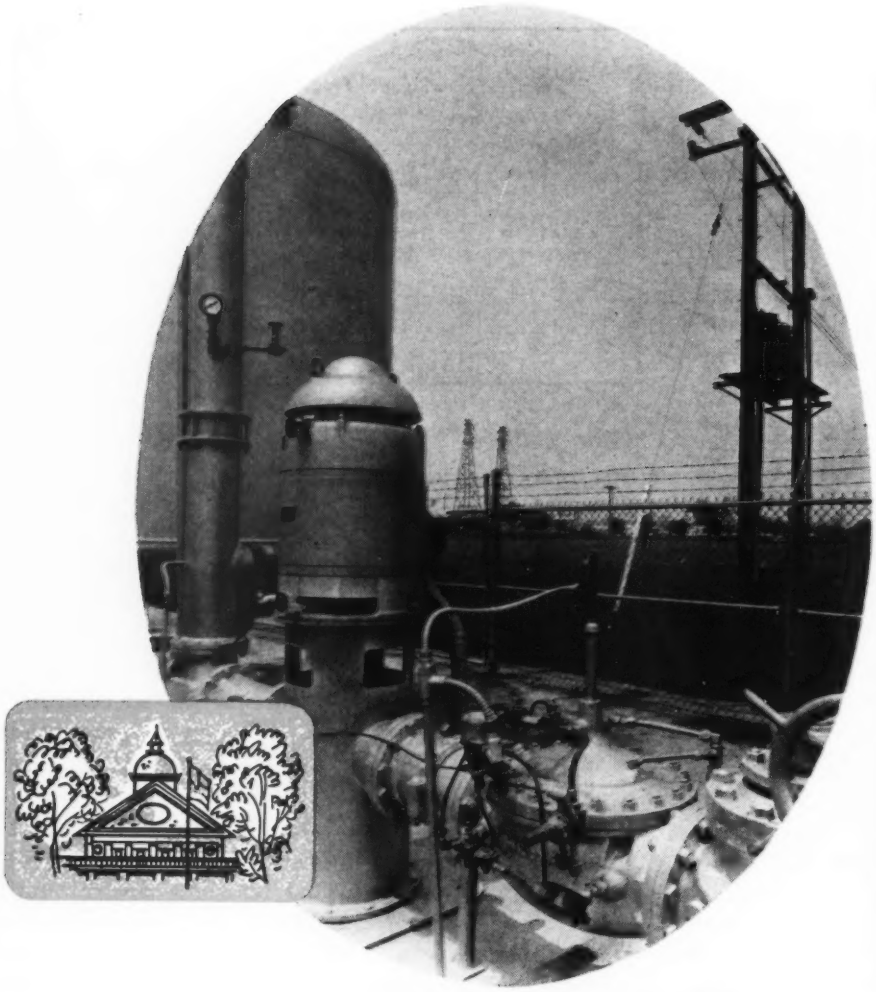
Recommendations on Publications

The need for two special publications was brought to the board's attention. The first is a yearbook containing, among other material, a complete roster of all members of affiliated associations. The committee asked that a special committee be appointed to compile the data and that the roster be published as soon as possible.

The second publication recommended is a brochure designed for distribution to prospective clients. This would tell what a consulting engineer is, what he does, and his value to the client in con-

New Council Executive Committee
1957 - 1958

President	E. J. Wolff	Chicago Assn. Illinois Assn.
1st Vice-President	G. W. Poulsen, Jr.	Intermountain Inst.
Secretary	B. M. Dornblatt	Gulf Inst.
Treasurer	L. K. Crawford	Illinois Assn.
Past-President	John K. M. Pryke	New York Assn.



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Over 100,000 satisfied vertical pump users agree there's no pump like Verti-Line for low first cost, economical operation, and negligible maintenance.

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nection with an engineered project. A committee is to be appointed to handle this assignment.

Finally, the committee recommended that instructions be issued to the secretary to reproduce all minutes of the board of directors meetings and all committee reports and to mail copies of these to all members in a form suitable for loose-leaf binding.

Fees & Contracts Committee

George Heft, of New Orleans, chairman of the fees and contracts committee, pointed out to the board that his committee had asked for instruction at the previous meeting but that no decisive action had been taken. Currently, he said, there was a divergence of opinion as to the program the committee should undertake. It was the opinion of some members of the committee that they should confine their activities to an effort to establish a schedule of fees that would be applicable only to work for the federal government. Others felt that it would be more beneficial to prepare a manual of practice covering both fees and scope of services, this intended for use by consulting engineers on all types of work.

The board, after considerable discussion, instructed the committee to continue their efforts toward the development of a manual of practice for consulting engineers and to further work as quickly as possible toward a fee schedule that would apply to public works, particularly having in mind the Federal Highway Program. The president also was authorized to appoint subcommittees to assist the fees and contracts committee in fulfilling this directive of the board.

Competitive Bidding

The committee on competitive bidding, under Thomas R. Miles, of Oregon, is a new committee, and it has so far confined itself primarily to fact finding and reporting its findings to the board. Miles gave a summary of recent

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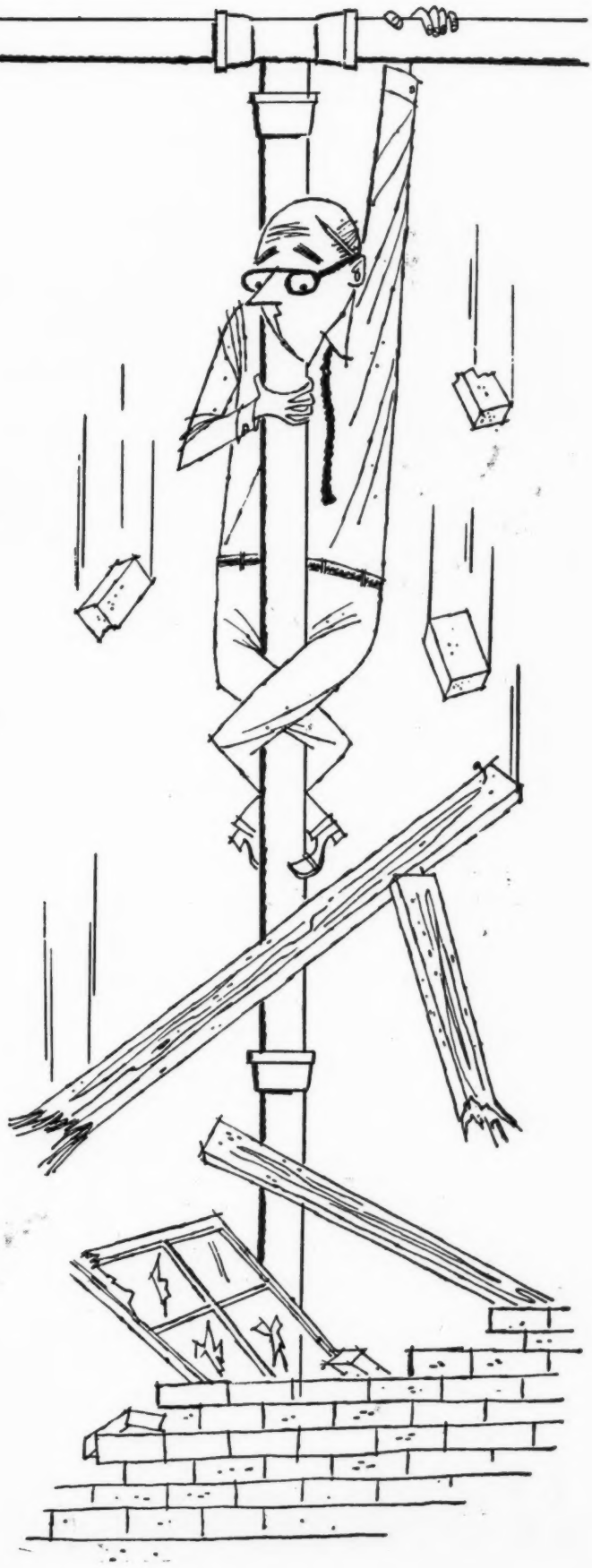

Specify DURIRON for *permanent* drain lines to handle acids and other severe corrosives. DURIRON is a high silicon iron that is corrosion resistant throughout. It is not a coating. DURIRON is resistant to practically all commercial acids and many other corrosive solutions.

DURIRON has been proved by many years' service in schools, hospitals, laboratories, kitchens, plating rooms, and in many other applications where the economics of good building call for permanent drain lines.

A complete line of DURIRON bell and spigot pipe and fittings is carried in stock by leading wholesalers in principal cities throughout the country. Write for free bulletin PF/4a or see Sweet's Architectural File.

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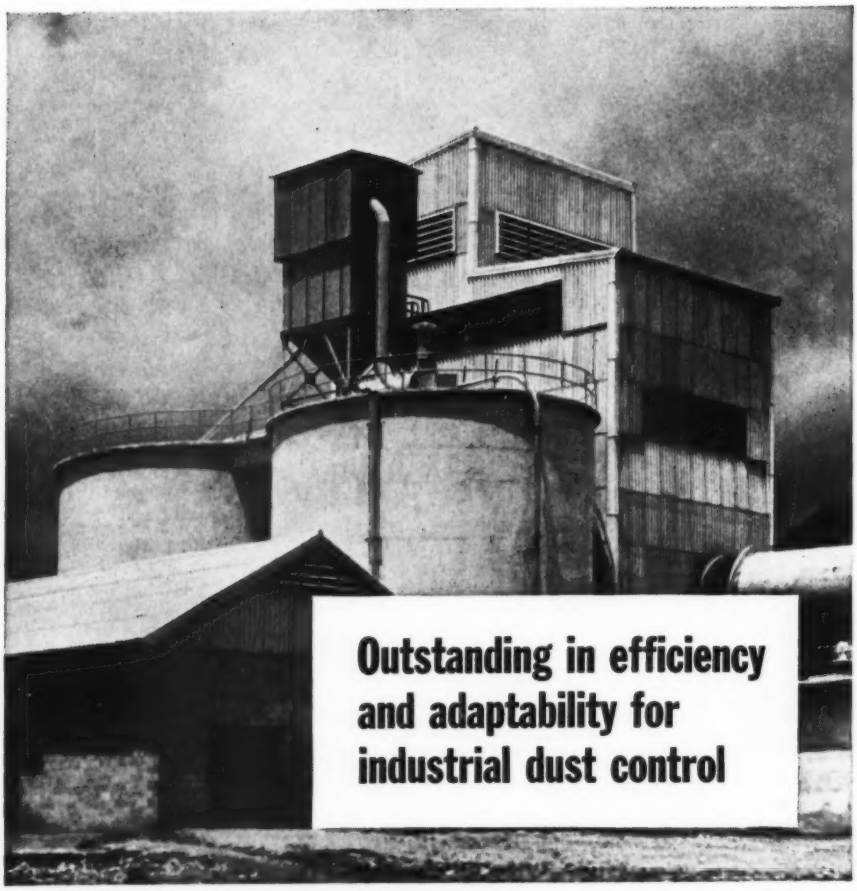

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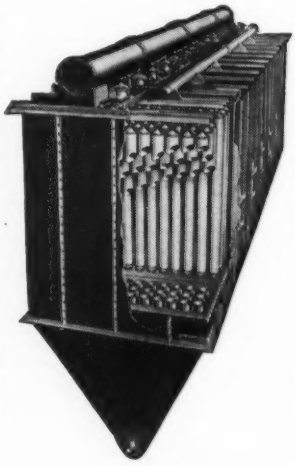

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activities of the Consulting Engineers Association of Oregon and the Washington Association in connection with the methods used by the Bonneville Power Administration in securing engineering services. The B.P.A., it seems, wants to select engineers in a professional manner, but it must abide by directives issued by the Department of Interior. These directives require that engineering services be selected on a somewhat competitive basis, with price an important factor. For some months there have been efforts made to have the Department of Interior clarify their directives, but so far no clarification has been forthcoming.

Miles stated that the Oregon Association had recently written to Fred A. Seaton, Secretary of the Interior asking that action be taken, and that it be made clear that his Department is willing to employ engineers on a negotiated rather than a price basis.

The board asked that the committee on competitive bidding continue to work as it has in the past, and that it turn over to the executive committee all pertinent findings for action by them. The board also asked all members of affiliated associations to inform the committee of all instances of competitive bidding in their areas.

Future Meetings

On the recommendation of the executive committee, the board voted to hold their meetings semi-annually, once in the fall and once in the spring, the spring meeting to be the Annual Meeting. The executive committee will continue to meet no less than quarterly.

Budget & Finance

So far as the future activities of the Council are concerned, the budget and finance committee report was the high point of the meeting. The report indicated that the Council ended its first year with a cash balance of about $7,000, and with the four new associations as part of the Council,

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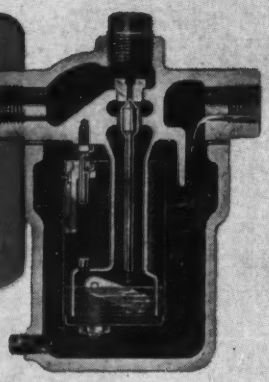

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½" to 1½"
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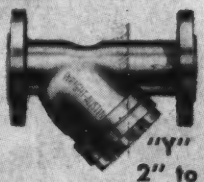

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2" to 8" (flanged)
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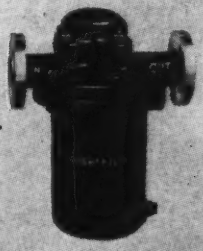

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Wright-Austin traps are available for lines ½" to 3", for pressures up to 600 P.S.I.G. and with capacities up to 65,025 pounds of water per hour.

For complete information on traps and other accessories that you can stock to advantage and depend on for efficiency that means low cost, write, today, for:

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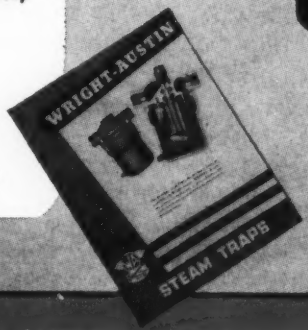

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the estimated operating funds for 1957-58 come to something over $25,000, while still leaving a $3000 cash reserve. With these figures before them, the board adopted a budget of $24,000 for the year, with $15,000 of this allocated to office operation and secretarial help. Then, $5000 was allocated to printing and miscellaneous expenses and $4000 to travel expenses for directors attending board meetings.

With this basic budget in mind, the board discussed the best approach to the establishment of a Council office and the securing of an executive secretary and additional stenographic help. The executive committee was asked to study the matter and determine the best solution. It is hoped that a part-time staff can be employed to work with the executive committee, operating this year from some location convenient to the president and secretary of the board. Then, as soon as increased income permits, the Council hopes to open an office in Washington, D. C., and provide it with a full staff to execute policies established by the board. It is hoped that this stage of development can be reached within another year.

New Committees

The Board of Directors empowered the president to set up a joint committee with the American Institute of Architects, to study mutual problems. It was recommended that the first task of this committee be the study of progress payments for professional fees. This is a most important matter for consulting engineers who have architects as clients. All too often, the consulting engineer finds that his fees are on the end of the list for payment, and he finds himself carrying the financial load of a project for many months without any pay. A system of progressive payments would solve this problem.

The president also was asked to appoint a fact finding committee to study the matter of mechanics'

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Smithcraft TWOSOME with brand new COMPOUND SHIELDING

45° x 45° SHIELDING IN A VERY SHALLOW UNIT WITH NO DARK CENTER STREAK

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For two or four 4' or 8' lamps, TWOSOME may be also specified with Plastic Louvers (42° x 42° shielding), Ribbed Skytex Glass, or Flanged Polystyrene (impact resistant). Ask the man from Smithcraft to tell you more about the TWOSOME for schools, offices, stores or similar installations.

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CORROSION

TYPE	HOW TO IDENTIFY
GALVANIC	Localized deep grooves or pits, often at contact between dissimilar metals.
UNIFORM	Uniform attack—may be on only one part.
INTERGRANULAR	Attack at grain boundaries.
PITTING	Rapid, deep pitting at several small areas. May be uniform or highly localized.

Why you can conquer all four kinds of corrosion with Goulds chemical pumps

When you buy Goulds Fig. 3715 chemical pumps you can build *specific* protection against all four types of corrosion.

Match the pump metal to your liquids. You can have the *entire* fluid end of the pump made of 316 stainless, Gould-A-Loy 20, nickel aluminum bronze, iron, iron with stainless trim or nickel aluminum bronze trim. These metals from stock. Any machinable alloy on application.

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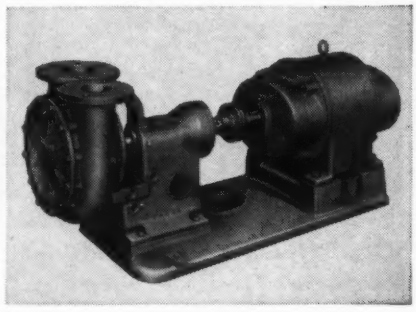
Match pump size to job

You can get Goulds Fig. 3715 in 9 sizes: capacities to 720 GPM, heads to 200 ft. Other features of Fig. 3715: water-jacketed support head permits handling liquids at 350°F.; impeller clearance can be adjusted without dismantling the pump. For more information, write for Bulletin 725.4.



These larger pumps also fight corrosion

For larger capacities or heads, you can get these other Goulds pumps in metals that resist specific corrosion:

Fig. 3405—single stage, double suction; 19 sizes; capacity to 6400 GPM, head to 425 ft. Bulletin 721.6. Popular sizes available in 316 stainless steel from stock.

Fig. 3305—two stage, opposed impellers; 8 sizes; capacity to 1200 GPM, head to 1000 ft. Bulletin 722.6.

Fig. 3189—single stage, open impeller; 11 sizes; capacity to 1080 GPM, head to 180 ft. Bulletin 720.4.

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liens against construction as they may apply to professional fees.

Resolutions Committee

As the Council continues to get new member associations, the board of directors becomes larger, and quite naturally, the meetings become more complicated and require more preliminary planning for the establishment of workable agenda. In view of this, the board asked the president to appoint a resolutions committee. This committee would receive from all member associations various topics that should be taken up by the board at future meetings. The committee then would put these topics into proper form and turn them over to the executive committee for inclusion on the agenda.

During this meeting it also became apparent that the constitution of the Council is far from a perfect document. Some portions are ambiguous and others are contradictory or vague. In view of this, a committee was appointed to determine what changes are needed in the constitution and by-laws. This committee is to report to the next board meeting.

Spirit of Compromise

At this meeting the board again demonstrated its ability to compromise apparently irreconcilable positions. This method of solution by compromise has become a part of the character of the group. It is because of it that the board has been able to develop during the year from the loosest type of federation to a sort of union in which the Council at each meeting strengthens its position as a central group. No longer is this a meeting simply of representatives of state or regional groups, each holding to states rights as the most important principle. The Council now has its own being, and the delegates look upon themselves not only as representatives of their associations but also as members of a national body with duties and responsibilities that go beyond states or regions. ▲▲

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Notes From Abroad

Thermal Power for Japan

Japanese power companies have ordered two, 156,250-kw turbine-generators from Westinghouse Electric International Co., one to be installed at the Karita station of Kyushu Electric Power Co., and one at the Osaka station of Kansai Electric Power Co.

Japan currently is in the second phase of a program started in 1953 to develop steam power plants to balance its predominantly hydroelectric system. The two new units bring to five the number of generators of this capacity purchased by the two southern power companies since 1953.

Overseas Consultants Incorporated — Ebasco presently has four thermal power projects underway in Japan: the Shin-Nagoya 156,000-kw Unit #1, for Chubu Electric Power Co; the Sendai 175,000-kw Unit #2, for Tohoku Electric Power Co.; the Shin-Nagoya 220,000-kw Unit #2, for Chubu; and the Yokosuka 265,000-kw Unit #1, for Tokyo Electric Power.

Ebasco recently was engaged for design and construction supervision on two additional stations.

Highway Improvement Study

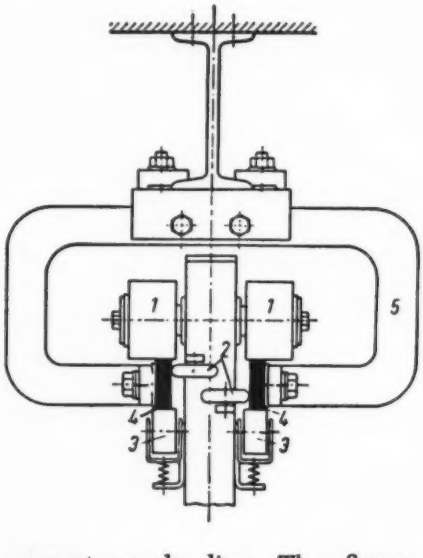
In line with its program to improve the existing national road network, the government of Ecuador has engaged the Miami, Fla., firm of Rader and Associates to make an engineering and economic study of Ecuador's 1300-mile highway system.

Ecuador's principal roads in some places must cross the Andes Mountains and in others dip down steep slopes into tropical forests. The report, to be completed this month, will recommend priorities of construction, standards of construction for new highways, and improvements of existing roads. A study will be made of the present maintenance system, and new standards and organization will be recommended. Where necessary, new sources of revenue will be suggested.

On the basis of the report, the government will ask the World Bank for a loan of between $10 and $15 million for immediate improvements and construction of new highways.

Live-Rail Overhead Conveyor

The German firm *Fa. August Stemann,* of Schuttdorf, Germany, has put on the market an overhead conveyor system that makes use of a "locomotive" driven by a 400-w motor along two live-rail tracks (42 volts) that also serve as the



current supply line. The figure shows the "locomotive's" running gear: (1) travel wheels, (2) guide rollers, (3) counter-pressure rollers, (4) runway and current supply rails, and (5) suspension brackets.

The motor unit pushes along a number of small conveyor trucks, each having a maximum carrying capacity of 220 lbs. After loading, the route for each individual truck is fixed by the setting of contacts. When the truck has reached its destination, the routing contacts open a track switch to permit the truck to roll up to its unloading point. The switch then closes behind it to keep the following trucks moving along the track circuit. The conveyor motor assembly maintains a uniform speed of 44 fpm. It also takes along, without stopping, trucks pushed onto the main track from the side tracks.

Suspension brackets (5), to which the current and runway rails are attached, are mounted close to the ceiling. Any desired number of side tracks for loading and unloading the conveyor trucks may be connected to the actual track circuit. Several track systems also may be interconnected.

Nylon-Chrome-Leather Belt

Great strength and a high coefficient of friction are advantages of a combination nylon—chrome—leather belt developed in England. The new material is capable of transmitting 30 hp at a speed of 150 fps, through a belt less than ½-in. wide. Tensile strength is 12,000 to 18,000 lbs per sq in. The material may be stretched up to 35 percent before failure, and is resistant to temperatures between —22 F and 158 F.

The belting may be used with high-speed motors. No idler pulley is required, saving power and reducing noise.

France Converts To 380-Kv

Because of steadily increasing consumption of electric power, France has found it necessary to convert to a 380-kv system. Need for increased transmission capacity was felt 15 years ago but the cost of replacing existing 225- and 150-kv lines was prohibitive. Instead, 225-kv two-circuit lines, which are convertible into 380-kv lines, were built by regrouping the conductors in bundles of two conductors per phase.

Now that total conversion to the new system is at hand, new lines will be 380-kv in instances when it is desirable to use the line at its

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final voltage either on its completion or within a few years. If it is not possible to use the line at 380 kv, it will be used at 225 kv. The 380-kv line has a capacity of 500 mw, and the 225-kv line 225 to 250 mw. Lines are equipped with a bundle of large cross-section conductors to attain high capacity.

About 540 miles of A.C.S.R. line (1.25 inches in diameter with a bundle spacing of 18 inches) are either being built or planned. Also, 100 miles of double lines equipped with the same type of conductors will be built in the Paris area as the beginning of a double 380-kv loop around Paris.

Results of research carried out in France and other countries will make it possible to estimate, in advance, the average corona losses of a line when its route and equipment are known. Influence of rain on losses has been studied closely. The way in which losses vary with the line altitude and with its operating voltage are known also.

Australian Engineering Surveys

The International Resources Engineering and Exploration Group, with headquarters in Washington, D. C., has entered into a working agreement with E. S. Clementson Pty. Ltd., of Australia, to carry out geological surveys for mining and oil search; aerial surveys for road and rail construction; and over-all feasibility studies for the development of major engineering projects in Australia.

Unified Power Grid

The Soviet Union is preparing plans for a unified power grid that eventually would cover the entire USSR. The system would include present and proposed power stations: hydro, thermal, and nuclear.

Several long distance transmission lines already are under construction. These will link the hydroelectric and thermal power stations of Stalingrad and Moscow, Kuibyshev and Moscow, and Stalingrad and the industrial area of the Donbas. The Stalingrad-Donbas line, according to Moscow radio, will be the first long distance d-c line carrying 800 kv. When completed, these lines will link a network of hydro stations on the Volga, Kama, and Dnieper rivers, and the Tsimlyansk inland sea and the Don, with the network of thermal power stations in the areas of Moscow, the Donbas, and the Ural Mountains.

By 1960 the unified grid in the European part of the USSR is to account for about half of the total power generated in the USSR. The Georgian, Armenian, and Azerbaijani grids also are being linked with the European system.

In Siberia, preparations are being made for the creation of a power system to embrace the area from Novosibirsk to Irkutsk. Eventually, the European and Siberian systems will be linked to make one unified system.

Spanish Fly Ash Utilization

Fly ash from certain Spanish power plants is being used as an additive to Portland cement, replacing part of it for construction purposes. It is also used in the manufacture of light types of concrete, mixed with cement or lime.

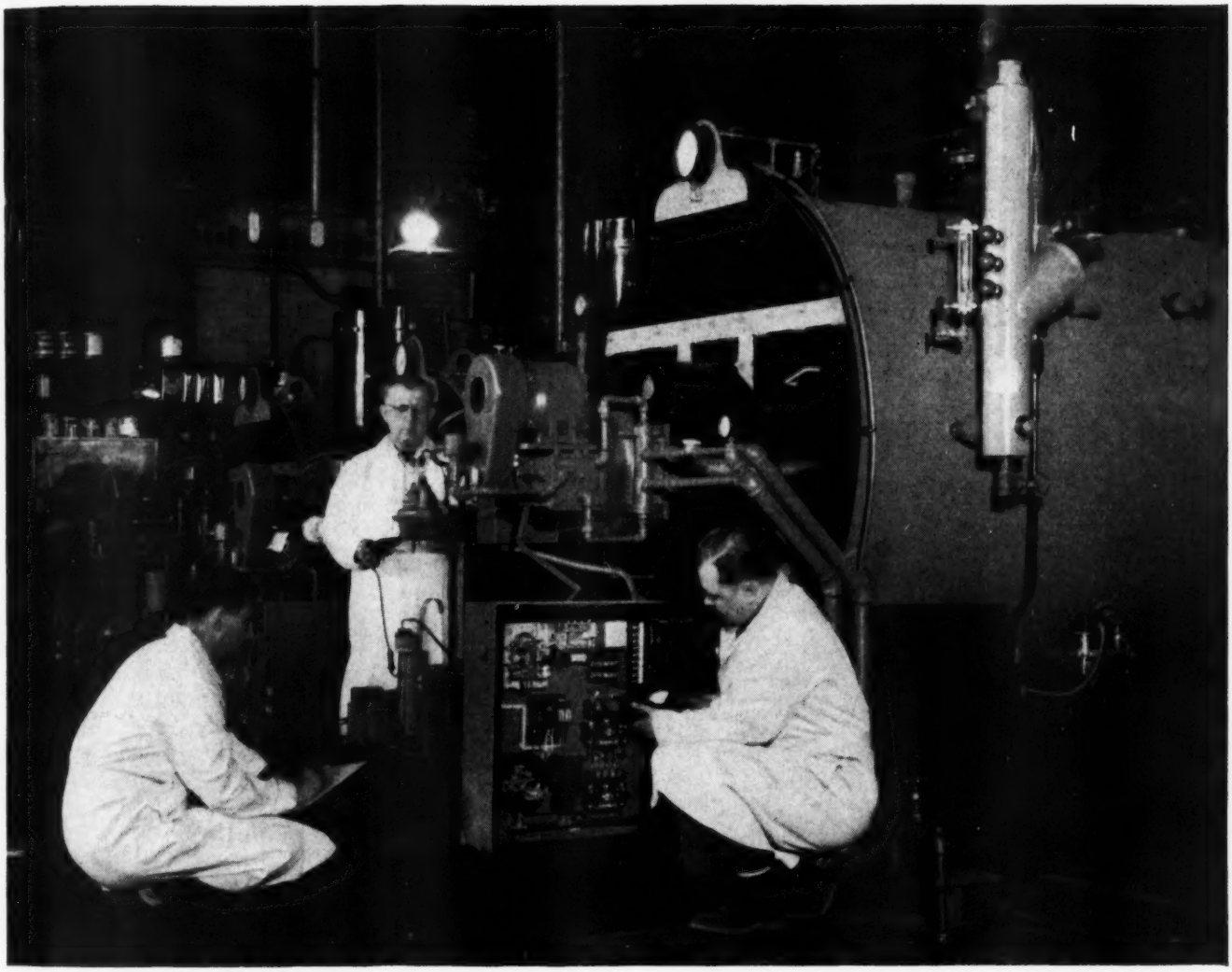
The fly ash used has the following specifications: slight loss of weight through calcination, silicic anhydride and a high proportion of residue insoluble in hydrochloric acid, low magnesic oxide and sulphuric anhydride, and considerable fineness.

Hydrothermal hardening of different fly-ash mixes with a binder and an aerating agent is used to produce a light concrete. Very fine aluminum dust used as an aerating agent produces the honeycomb structure desired. Any type of lime containing a minimum amount of CaO can be used as a binder. With quicklime, fine grinding assists the reaction with the calcium hydroxide produced in the hydration process and the active part of the fly ash.

The resultant product is light gray in color, finely pored, and offers a lower water absorption than ceramic tile.

Harbor Development

New harbor facilities recently completed at Lobito Bay in Angola, Portugese West Africa, will enable the harbor to handle the increasing volume of traffic from Northern Rhodesia and the Belgian Congo. Included is a 900-ft



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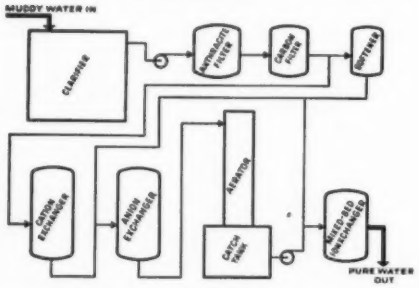

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extension of the deep water south wharf, with additional equipment; and the foundations of an ore loading plant to handle mineral exports. These additions and the grain elevator added last year will double the port's capacity. Cost, apart from the ore loading plant, is about $1½ million.

International Highway

The governments of Kenya, Tanganyika, and the Belgian Congo have been invited to a conference being organized by the International Road Federation, to be held in Salisbury, Rhodesia. Purpose of the conference is to discuss conversion of the present Great North Road into a highway up to international standards along 3600 miles of its route. Invitations also have been extended to representatives of London finance houses and of the International Bank.

Highway Engineering Program

A program of post-graduate instruction in highway engineering will be inaugurated at the University of Alberta this year. First of its kind in Canada, the course will be under the direction of the civil engineering department of the University.

One of the main objectives is to provide expanded facilities for advanced instruction for young engineering graduates in preparation for any one of many positions in highway engineering.

The education, research, and extention programs were integrated after study of similar projects at various schools in the United States and in Europe.

The new program involves an expansion and extension of existing post-graduate courses. Soil mechanics and foundation engineering courses, the fundamental basis of modern road design and construction, will be continued. Instruction will cover the design and control of construction of asphalt and concrete pavements, highway planning, and traffic engineering. Elective courses with subjects such as highway bridge design and river engineering will be available.

Research projects concerned with highway problems will be greatly expanded. Problems resulting from soil and climatic conditions peculiar to Western Canada and the Far North will be given special attention. These include: compaction of soils; prevention of frost heaving of soils by chemical treatments; effect of cycles of freezing and thawing on strength of soils; treatments to improve the stability characteristics of base course gravels of types having exceptionally high affinity for water; and stabilizing factors of slides of a particular nature which occur widely along river valleys in Northern Alberta, Northeastern British Columbia, and parts of the Yukon.

New Mining Machine

A new mining combine for the building of galleries in iron ore pits has been designed by Soviet engineers. The combine moves along a mine railway under its own power. Main working part is a rig of six high-frequency perforators.

Ore is blasted away and loaded by a mechanical shovel onto a conveyor that is serviced by ten, five-ton wagons. During the loading operation the drilling unit is drawn back by a motor. Pneumatic engines fitted with remote controls operate the equipment.

The combine is operated by four miners and carries out two complete cycles of work in one shift. Depending on the hardness of the rock, the combine covers from 200 to 400 meters of gallery in one month. This compares to 100 meters per month by 30 miners using conventional equipment.

Pig Iron Conversion

A new method of converting pig iron into steel has been developed in Germany, using a rotating drum instead of the conventional tank or pear-shaped converters. The molten metal is tapped from adjacent blast furnaces and passes into the 60-ton drum through an opening at one end and is discharged at the other through a tapping hole of the kind used in the open hearth furnace. The feed of pure oxygen is arranged in two separate streams.

The rotation of the drum, which can be varied between once every two minutes to once every ten minutes, prevents over heating

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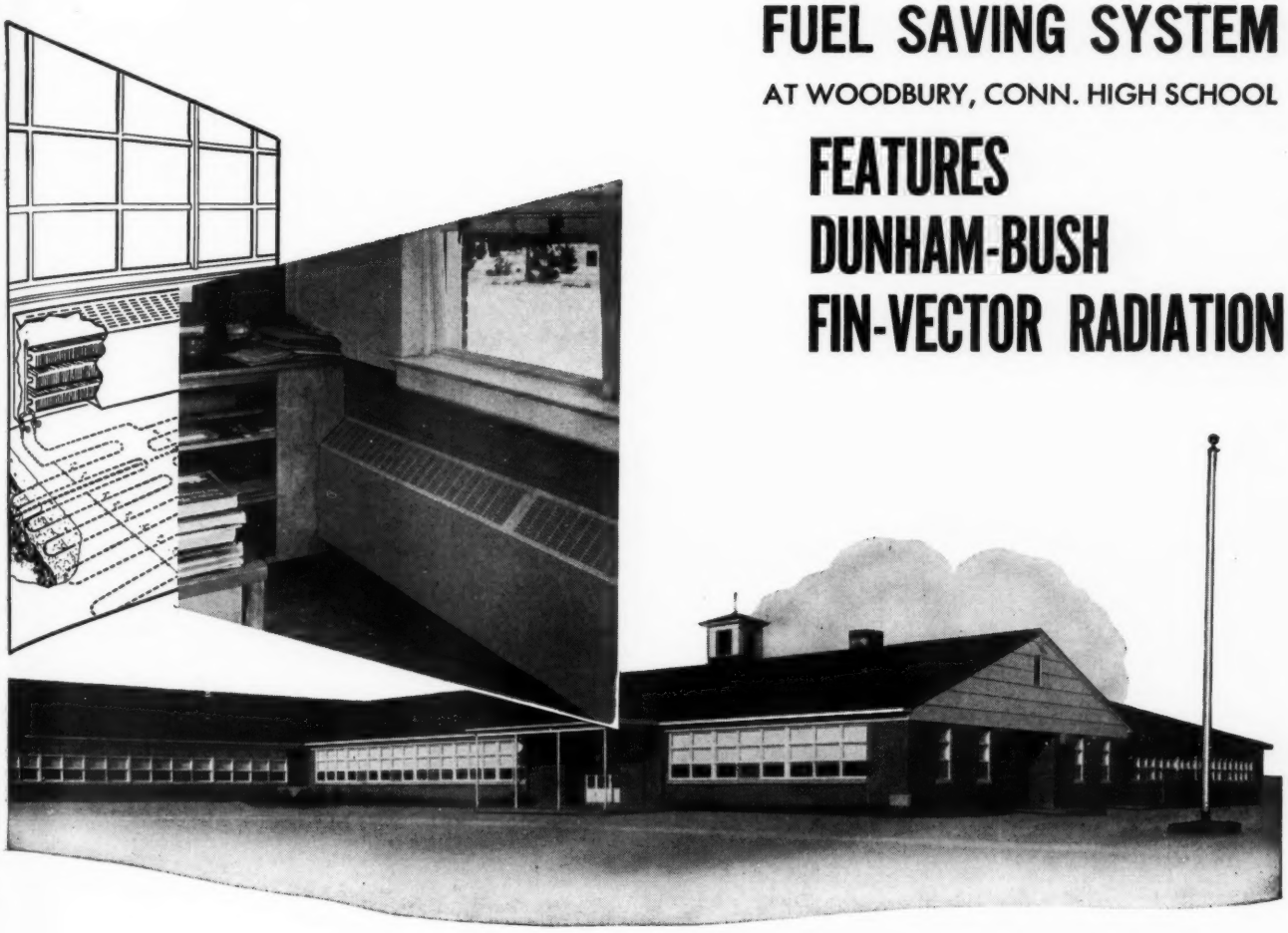

Consulting Engineer: Richard Shipman Leigh, Woodbury, Conn.
Architect: Edward M. Foote, Jr., Cornwall, Conn.

22,000 SQ. FT.—ANNUAL FUEL BILL LESS THAN $1000. Fuel saving is the big story at Woodbury High School. Neighboring schools are spending $2000 to $3000 for similar heating areas, compared to Woodbury's less than $1000.

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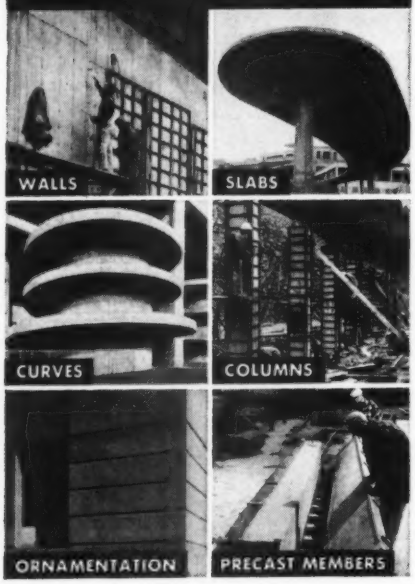

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New Inner Harbor

Dredging of the first section of the new inner harbor for Port Kembla, Australia, is expected to start the latter part of this year. In this first phase, 2½ million cu yds of muck will be dredged from Tom Thumb Lagoon and retaining walls built at the entrance.

In the second stage another 1.7 million cu yds will be dredged, to give a depth of 32 feet at low water. When completed, the $35 million harbor will serve the steel industry in the Wollongong-Port Kembla area.

Bearing Wall Construction

Bearing walls used for embankments, trenches, and canals are being constructed in Italy by a technique that employs rectangular or square reinforced concrete slabs that are set in place and anchored to the ground behind by means of concrete shanks poured in place. The method is inexpensive, fast, uses only a small amount of materials, and makes it possible to build very high walls on crumbly ground because of the walls' light weight.

Slabs are fabricated on the site, using simple mountable molds on the sides of which niches or projecting parts provide for male and female couplings on the four sides where the slabs connect. Before casting the concrete, one or more cores are placed in the molds to produce truncated, cone-shaped holes from which reinforcing rods are left jutting.

In these holes are housed the heads of the shanks anchoring the slabs to the ground. The shanks are small, reinforced concrete bars, cast in place, in holes drilled in the ground.

When the slabs are set, the molds are dismantled and installed in five operations. A concrete foundation is laid into which the bottom edge of the first row of slabs is placed with the female coupling edge up. With electric or pneumatic ground drills, holes are prepared for casting shanks to match position of holes in the slabs. The last stage is sealing of the joints and, on the top row, laying an iron bar in the female coupling groove. Mortar is then poured over this to form continuous beading.

Building Blocks

An Australian architect has perfected a new building technique using groove and ridge building blocks that can be manufactured mechanically and can be assembled on the building site without use of special tools or adhesives.

The accompanying figures illustrate the basic types of blocks. Fig. 1 shows the types H and H/2

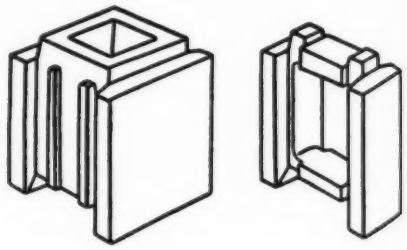

Fig. 1

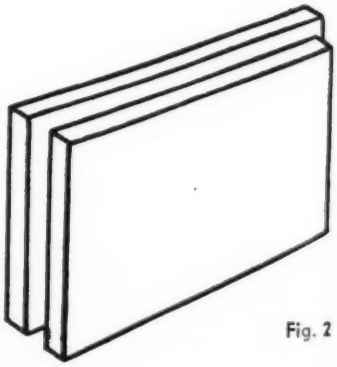

Fig. 2

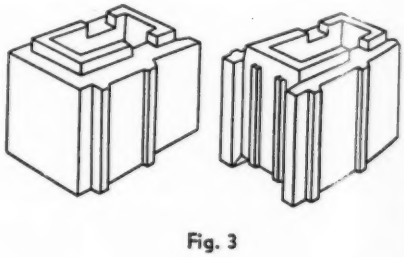

Fig. 3

blocks used as connecting elements and for construction of pillars. Type H blocks can be filled with concrete or reinforced with steel bars. The Type H/2 blocks

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FERROLITE is a very hard, yet resilient, acid and waterproof, jointless type of floor finish that offers you a choice of colors that go all the way through — they won't fade, wash or wear off. FERROLITE can be laid on any type of solid base and will withstand concentrated floor loads of over 600 lbs. per square inch without indentation at a temperature of 77°F. FERROLITE COLORS are Red, Brown, Gray and Black.

ADVANTAGES—

FERROLITE Finishes are jointless, very homogeneous, easily kept clean, harden like stone and can be put into service 4 hours after installation. FERROLITE is elastic, resilient under foot, AND — it's ACID-PROOF. Also oil and grease proof FERROLITE now available.

APPLICATIONS—

Both the acid-proof and standard FERROLITE Floor Finishes are especially suited for chemical plants, plating rooms, acid processing plants, food plants, paint and varnish plants, in fact wherever chemicals or acids or a combination of both create a flooring problem.

INSTALLATION—

FERROLITE is installed in varying thicknesses of 1⅛" up from thermo-regulated mobile power units especially designed in Europe for us and now available through Fulton in this country. All Fulton installations are made with our trained floor crews under our supervision which guarantees both quality of workmanship and uniformity of the finished product.

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are specially suited for door or window frame enclosures or for wall mantels.

The type P blocks, as shown in Fig. 2, fit into the grooves of the Type H blocks, forming hollow spaces in the cross section of the wall, together with the other ridge blocks. In Fig. 3, Er and El, used for construction of intersections, are shown.

For assembly, no mortar is used. Stability of the wall results from the fit of one block with another.

A building contractor faced with an order to construct 2000 railway store houses mounted the machine for production of these blocks on a train, moving it from one building site to another. A work gang followed, assembling the building blocks on each site.

Steam from Garbage Disposal

The dual garbage disposal and heat generator plant of the *Compagnie Parisienne de Chauffage Urbain* is one of two new plants in Paris supplying steam for the central heating systems of governmental buildings, hospitals, large stores, and other customers. The second new plant burns fuel oil.

With these and two existing plants, production now exceeds a million tons of steam a year, for distribution through a 30-mile network of pipes.

Mine Air Conditioning

The air-conditioning system at the Stobie section of the International Nickel Company's Frood-Stobie mine near Sudbury, Ontario, makes use of the heat releasing properties of water turning to ice, and the heat absorption of melting ice.

In winter, water from the mine's pumping system is furnished at 120 psi to four spray points at the top of each stope. The fine particles of water sprayed into the air passing through the stopes turn to ice, releasing heat to the air. In one winter of operation some 40,000 tons of ice were formed at the bottom of the stopes. The heat from ice formation, along with the heat absorbed by the air from the large area of wall exposed in the stopes, added up to 15 million Btu.

Although the surface temperature during the winter ranged to —25 F, fresh air delivered from the main intake of the mine ventilation system 600 feet below surface stayed between 27 and 30 F as a result of its side trip through the stopes.

In summer, the ice is melted as warm air passes through the stopes, cooling it by five to ten degrees. Humidity is reduced as the air cools below the dew point and much of its moisture drops onto the stope bottom.

The fan that delivers air underground has a diameter of 198 inches. It blows fresh air from the surface through a 300-ft vertical airway 20 feet in diameter, into two open stopes mined by the blasthole method for this purpose between the 300- and 500-ft elevations. Each stope is 80 x 200 feet and 200-ft high. Stopes are separated by a pillar 70-ft wide.

Plant Produces Own Power

A brake for running-in diesel motors and generating electricity at the same time has been developed in a British plant that produces about 300 diesel motors a day. The company saves between $20,000 and $25,000 a year by using power developed in running-in engines to generate electricity. This is fed into the plant electrical system.

Special equipment and simple control gears have been developed, making the system easy to operate and guarding against harm through operational error.

Compare Building Costs

In order to determine the comparative costs of buildings constructed by the heaped concrete method and with conventionally built brick walls, the Federal Ministry of Housing Construction of West Germany had two buildings of the same size and type constructed. The buildings were apartment houses, three stories high, with 15 apartments per floor.

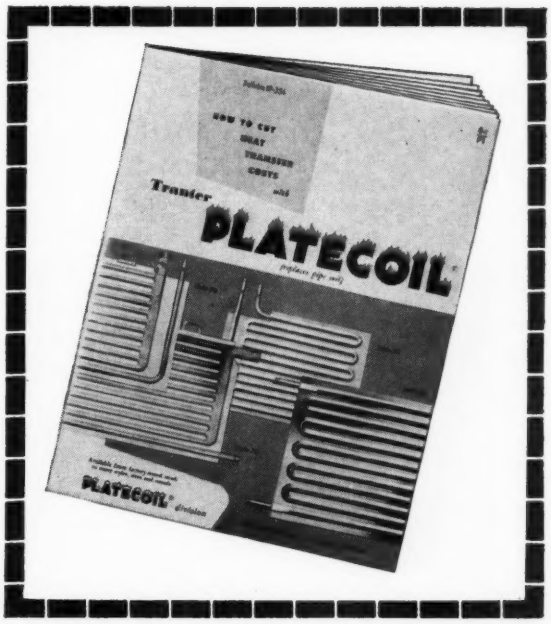
One building was built with heaped concrete walls, 22-cm thick (about 8.7 inches), by the mono process. Walls of the other building were solid brick, a brick and a half thick (about 13.5 inches).

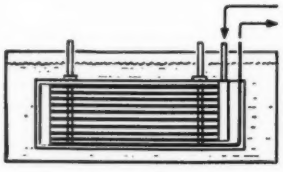
In the mono process, the concrete wall core is paneled inside and outside by a layer of lightweight plates made from fine

new HEAT TRANSFER SKETCH BOOK

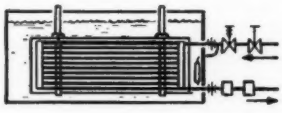
shows how to cut costs all over the plant!

Valuable ideas based on actual installations of Tranter Platecoil heat transfer units are contained in an informative new bulletin on Platecoil construction, installation and cost-saving advantages. Featured prominently in the booklet are 14 sketches for as many uses of Platecoil in a complete variety of tanks — with a brief description of each installation. Platecoil units can be used in many ways and in many industries. Send today for your free copy of Bulletin P-85, and discover how you can cut heat transfer costs all over the plant with Tranter Platecoil.

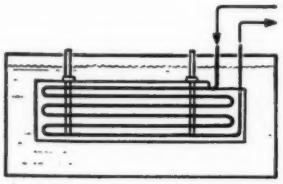




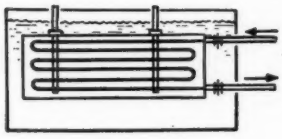
OPEN PROCESS HEATING TANK



OPEN PROCESS HEATING TANK



OPEN PROCESS COOLING TANK



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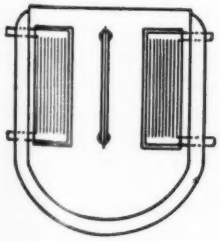
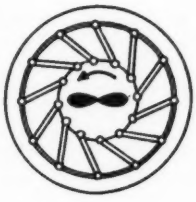
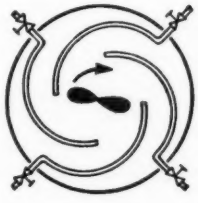


JACKETED TANK



AGITATED TANK



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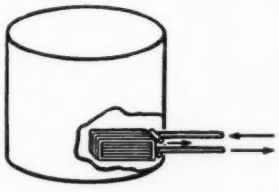
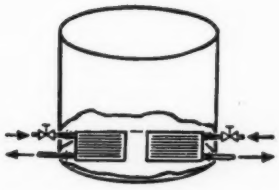


CLOSED TANK, CLOSED MOUNTING

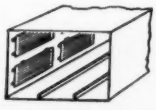


CLOSED TANK, CLOSED MOUNTING

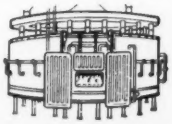
CLOSED TANK, EXTERNAL MOUNTING

CLOSED TANK, EXTERNAL MOUNTING

WASTE-HEAT RECOVERY

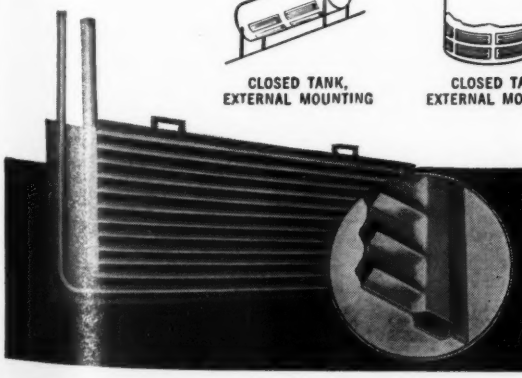


OVEN AND FURNACE



HEAT SCREEN

You'll find our Catalog in Sweet's Plant Engineering File.



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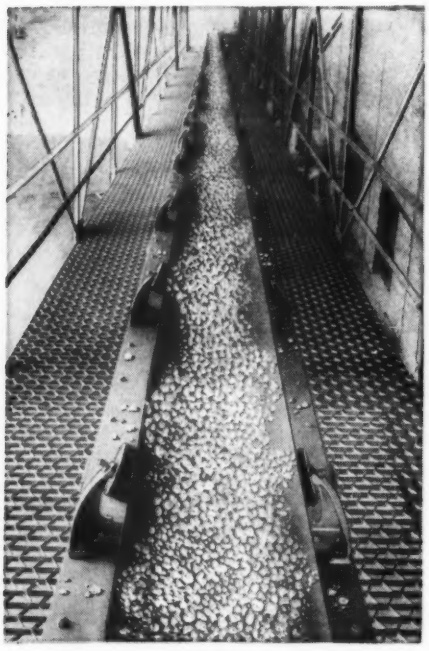

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wood. These plates are set up as a casing prior to the concrete pouring and remain in the structure. During the casting process, the plates are kept in place and properly spaced by means of spare pieces of board and galvanized wire stirrups. Upon solidification of the concrete, the braces are removed while the wire stirrups remain in the wall.

Calculated per square foot of habitable floor space, the heaped concrete structure required 14.65 hours, and the brick building 17.14 hours. Cost of construction materials for the concrete building were about 80 percent of the cost of materials for the brick work.

Iron Ore Find in Ukraine

Large iron ore deposits are reported to have been discovered near the town of Kremenchug, in the Poltava district of the Ukraine. Although prospecting is not yet completed, the new iron ore basin promises to become the major iron ore center in the Ukraine. Estimates are that each pit can produce 2,000,000 tons of ore per year for 100 years. Deposits of magnesite quartizite have been found near the surface where they can be mined easily.

World Bank Loans

In the first quarter of 1957, the World Bank made loans to India, Iran, and Peru, totaling $85.6 million. The loan to Iran, the first the country has received, will provide short-term financing required for the Second Seven-Year Plan, which encompasses development of agriculture, transport, electric power, industry, and social services.

The Plan is to be financed mainly from oil royalties, with the Bank loan used to fill in the gap while oil production gradually is being restored. Over the seven-year period, about $1 billion in royalties will go toward the Plan.

Loans from the World Bank and U.S. commercial banks to the Indian Air-India International Corp. will finance purchase of three Boeing long-range jet passenger planes, together with spare parts and auxiliary equipment.

The loan to the *Banco de Fomento Agropecuario,* of Peru, is the second $5 million loan to help finance a program of long-term lending for development of agriculture, including importation of agricultural machinery, irrigation equipment, livestock, and some equipment for fisheries.

Oil Into Water Gas

A new process for conversion of oil under pressure into water gas will be used at the $17 million chemical plant now under construction at Shellhaven, in England, for the manufacture of nitric acid and ammonia. These end products will form the basis for large-scale production of agricultural fertilizer.

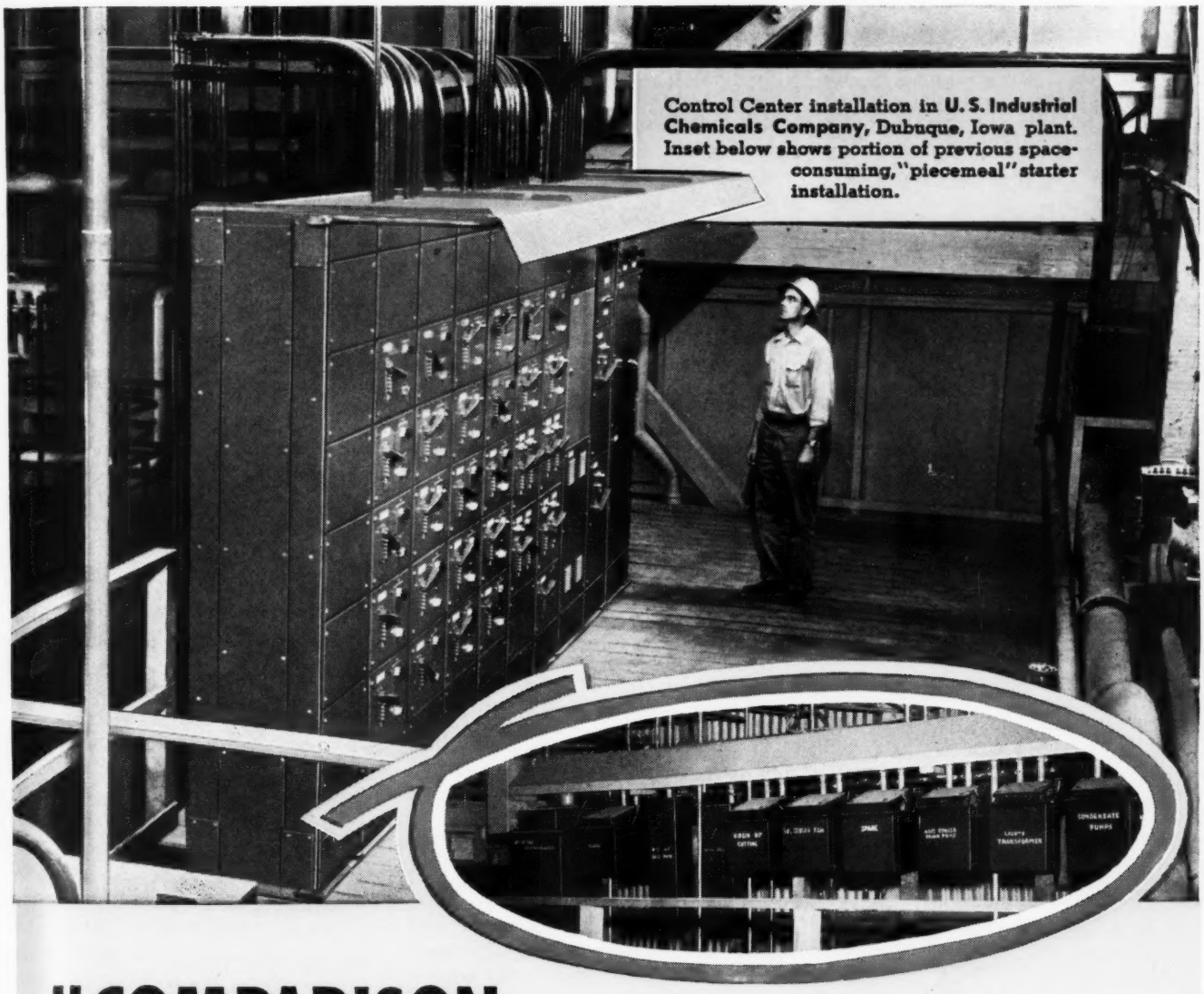
The process also has uses in the steel industry and for the manufacture of gas for domestic usage. Using any hydrocarbon ranging from gas to heavy fuel oil as a base material, the process offers low cost and flexibility. Up to the present, water gas has been produced in Europe from coal and coke.

Potentials of Congo Studied

Ebasco Services, Inc., of New York, is conducting a study of the potential industrial development of the Lower Belgian Congo for a Belgian financial, commercial, and mining firm with many interests in the area. Ebasco is reviewing plans for gradual development of hydro sites at Inga, some 87 miles from the coast; preparing preliminary basic designs and layouts for an electric transmission system to possible industrial sites on the lower river; and exploring the possibilities of establishing large power consuming industries, such as aluminum reduction plants, in the region.

The Congo is one of the few great undeveloped energy resources in the world today. It is navigable for long stretches between rapids, the navigable section between Leopoldville and Stanleyville being over 1000 miles in length. In addition to 8000 miles of navigable waterways, the Belgian Congo has over 300 miles of railroad trackage to facilitate trans-shipping of cargoes from boat to train and back to boat around the river rapids.

The present power development plans envision a 28,000,000-kw



Control Center installation in U. S. Industrial Chemicals Company, Dubuque, Iowa plant. Inset below shows portion of previous space-consuming, "piecemeal" starter installation.

"COMPARISON convinced us that a SQUARE D Control Center offered us MORE!"

These design features make Square D your logical choice, too . . .

INCREASED SAFETY because bus bars are fully enclosed, rigidly supported and have ample cross section. Circuits are isolated by individually enclosed plug-in units. Disconnect handle designed for maximum operator protection.

FLEXIBILITY. Individual plug-in units or complete sections are easily added, removed or exchanged. Pushbuttons, pilot lights, and selector switches are readily added to unit doors.

INSTALLATION ECONOMY. All wiring channels are large and accessible from front without removing units. No "wire fishing."

SPACE ECONOMY, TOO. Up to six combination starters fit in a 20" x 20" x 90" section. Plug-in unit heights designed in space-saving increments of 3 inches.

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SEE MARIETTA

Marietta concrete silos can solve your storage problems quickly, economically and efficiently. Whatever your needs Marietta will design the system to meet your requirements. Trained crews handle the erection from the ground up in the shortest possible time. There are NEVER ANY DELAYS due to critical material shortages.

Sturdy air-cell or solid concrete stave construction holds materials in safe, dry storage. Mechanical or pneumatic operated conveyors, feeders and discharge systems can be mounted on top or side walls.

Call in Marietta now. See how quickly you can end material wastes and handling costs . . . improve plant production and appearance with an efficient Marietta Storage System.

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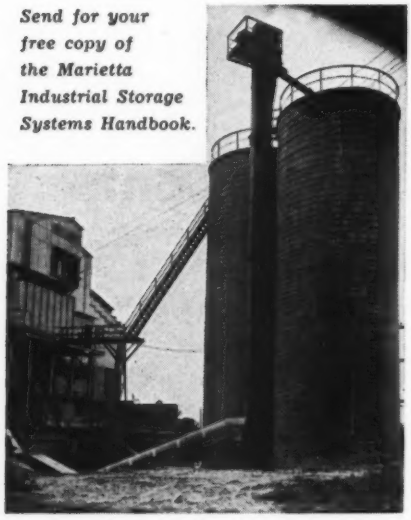

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hydro project on the Congo in successive stages as output is required in the over-all industrial development program. This capacity represents almost 25 percent of the estimated total potential.

Closure of the river will involve submarine work reaching down 300 feet to the riverbed in the deep chasm of the main channel. It is planned to effect closure by dropping large stones into the channel.

Stream flow measurements indicate that the design must provide for a flood of 85,000 cubic meters per second, the maximum flow being 65,000 and the minimum 24,300. Development of the site prior to construction of the dam would utilize up to 12,000 cubic meters per second.

Adaptation to peculiarities of the site, with diversion works placed in the broad shallow section of the river, will permit postponement of construction of the Congo Dam until the first 8,400,000 kw of capacity has been installed in two proposed locations. These initial installations would be at the lower ends of valleys paralleling the river, where dams and power plants discharging directly into the river would be constructed. Subsequently, water would be diverted from the river to the upper ends of these tributary valleys, through large diversion canals, for operation of the power stations.

Determination of an economic voltage level for the transmission system and a general plan for transmission lines and terminal transformer and switching installations are a part of the over-all study. Ebasco is proposing use of a 380-kv system, with the expectation that collateral industrial development in neighboring territories may create an opportunity for export of power to such key cities as Pointe Noire, in French Equatorial Africa and Loanda, in Portugese Angola.

Participating in the study with Ebasco were: J. H. Coates, Marketing Consultant; and W. E. Slemmer and C. E. Bragunier, Electrical Engineers.

Study Rock Stratum

Scientists took advantage of a 60-ton charge of explosives set off at the site of the Adaminaby Dam, in Australia, to ascertain shape and dimensions of the Sialsima Boundry, a stratum of rock 12 miles below the surface. The charge was fired in a 1084-ft tunnel to dislodge 40,000 cu yds of fill for the Dam. The investigators set up seismic wave detectors at 14 towns and cities to measure the time the shock waves took to reach each of the stations. Correlation of this information is expected to yield an accurate picture of the rock stratum.

Plastic Joint Sealer

A foam plastic joint-sealing strip developed by *Comprifalt C. V.*, Rotterdam, can be used to seal joints in concrete structures, steel door cases, and window frames. The material is light, durable, highly adhesive to steel and concrete, elastic, proof against temperatures to 150 C, watertight against pressures of more than 100 lbs per sq ft, and resistant to acids and alkalis.

Walls of the joint are first covered with an adhesive, which is allowed to set for an hour before the strip is pressed into place. The strip, because of its elasticity, compensates for settling, temperature expansion and contraction, and other movement. It is recommended also as a seal in the sleeve ends when laying concrete sewer pipe.

Spanish Buy "Brain"

A $30,000 systems-simulating laboratory has been purchased by the Ministry of Defense for the General Industrial Materials Div. of the Spanish government.

The laboratory, manufactured by Servo Corporation, will be used for control systems design and evaluation and was designed to cut over-all engineering project time and costs. The machine is supposed to solve anything from navigational problems to mechanical linkage and gear train ratios.

The systems-simulating laboratory includes 10 amplifiers, two corrective networks, a modulator and a demodulator, four drawers, an indicator, and an oscilloscope. It also has racks of power supplies, regulated and unregulated, with associated controls. A converter was included to convert 50 cycle power to 400 cycles. ▲▲

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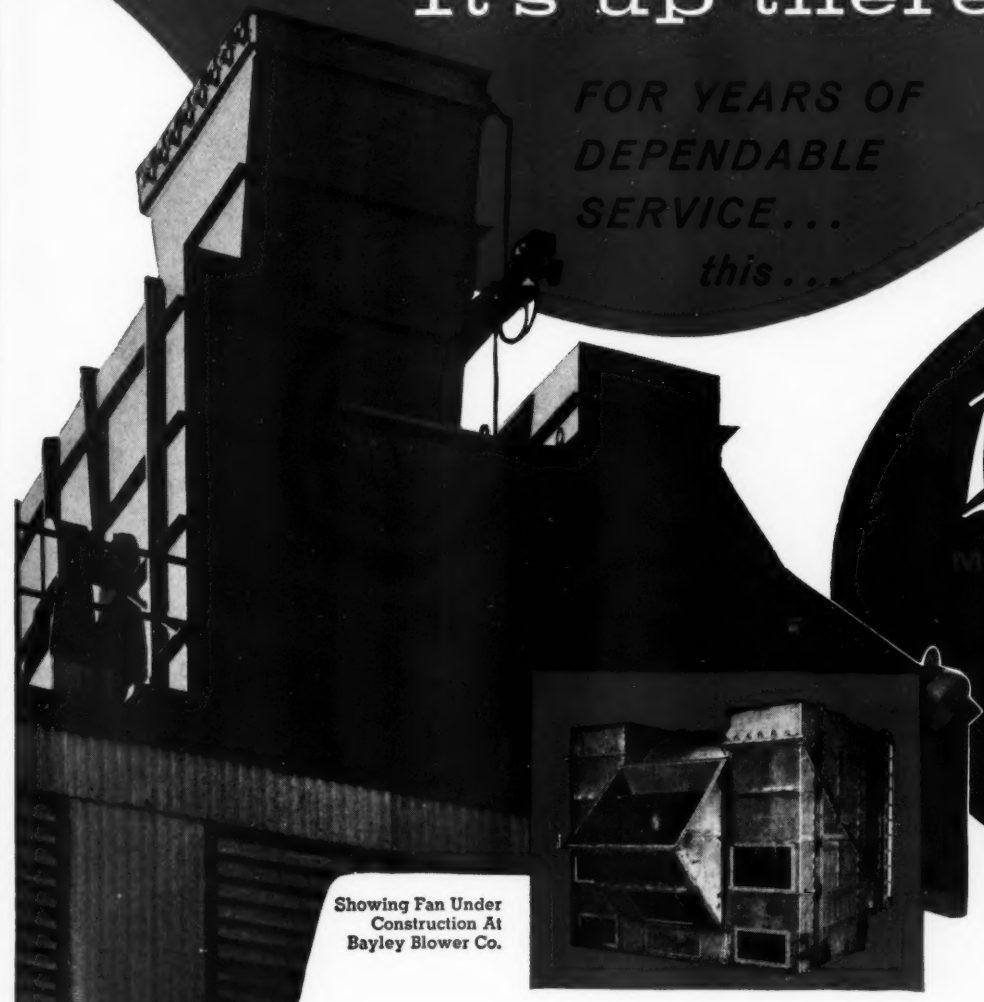

Showing Fan Under Construction At Bayley Blower Co.

Bayley R.D.D. MEDIUM-SPEED INDUCED DRAFT FAN

...RECENTLY INSTALLED ATOP THE NEW 1¼ MILLION BARREL CAPACITY MILWAUKEE PLANT OF THE MARQUETTE CEMENT MANUFACTURING CO.

First of its type in the U. S., this large medium-speed BAYLEY-built mechanical draft fan is specially designed to induce air through cement clinkers, during processing operations at Marquette Cement Mfg. Company's new Milwaukee plant. The open air installation is typical of today's trend in mechanical draft installations.

Due to particularly severe performance demands in cement processing, Bayley's high standards of craftsmanship assure longer, more dependable fan service life . . . a fact attested to by the many instances in which BAYLEY equipment has been selected by the leading producers in the industry.

Engineered Air Handling Equipment

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WRITE for *Bayley FAN-O-GRAPHICS*—A Guide for Specifying and Operating Centrifugal Fans.

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News for the Consultant

Michigan Consultants Form Consulting Engineers Association

An estimated 50 Michigan consulting engineers voted, at a meeting in Lansing, to form the Consulting Engineers Association of Michigan. First official meeting of the new group will be held in Lansing in late June, according to W. B. MacWhirter, temporary president. At that time, permanent officers and charter members will be elected; proposed constitution and by-laws voted on; and the activity program for the coming year decided on.

Selected at the April meeting as temporary officers were: president, MacWhirter, W. B. MacWhirter and Associates, Grand Rapids; vice president, Dr. John R. Snell, Michigan Associates, Lansing; and secretary-treasurer, Wesley Bintz, Lansing, past president of the Michigan Society of Professional Engineers and a board member of the National Society of Professional Engineers. Charles Hamilton, Grand Rapids, is chairman of the nominating committee.

MacWhirter said, "It appears that the initial organization will have about 50 charter members, all of whom will be consulting engineers practicing and operating a consulting engineering business on a fee-retainer basis." The report, circulated by the temporary officers to some 160 consulting engineers and engineering firms in Michigan, added that "Associate memberships possibly would be available to those registered key engineers who are now employed in consulting engineering firms and who, someday, may desire to enter full professional activities." However, the report added that the matter needs further discussion before being adopted by the organization.

Presiding for the election of temporary officers at the Lansing meeting was T. E. Roche, of Minneapolis, a member of the Consulting Engineers Council membership committee. Roche has helped engineers in private practice to form consulting engineers associations in Illinois, Iowa, and North Dakota, and has assisted a number of associations during their initial organization.

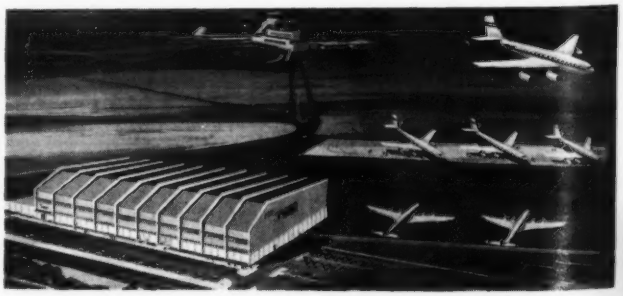
Edward J. Wolff, Chicago, secretary and president-elect of the CEC, gave a brief talk on suggested objectives for the Michigan group. Others appearing on the program were Melvin Nord, consultant in legal and technical problems and patent attorney, Detroit; and Hunter Hughes, editor of CONSULTING ENGINEER.

Larger Planes Require New Hangar Design Concepts

Construction of TWA's $2 million "jet age" hangar has begun at the San Francisco International Airport on a 16½-acre site southwest of the passenger terminal building. Covering an area of 43,000 square feet, the hangar will have a cantilevered roof with a span of 135 feet. It will be 320-ft long and 44-ft high.

The hangar will house two of TWA's Jetstream Constellations, scheduled to start service in July, or two of Boeing's all-jet 707's, slated for delivery in 1960. An outside parking ramp will have capacity for parking ten large aircraft.

Frame will be of structural steel with exterior walls of precast reinforced concrete and Colorbestos siding. Front of the hangar facing the Bay Shore



HANGAR WILL HOUSE TWO JET AIRLINERS AND HAVE RAMP PARKING SPACE FOR TEN MORE.

Freeway will have three floors for use as offices, flight crew quarters, and lunch and locker rooms. A 400-car parking lot will adjoin the building.

Scheduled for completion in December, the hangar was designed by The H. K. Ferguson Company, of Cleveland, Ohio.

The U.S. Air Force, working with Luria Engineering Co., has developed a maintenance hangar for use with military aircraft that also is specially designed to handle the newer, larger types of planes. The building is designed around a flexible "aircraft fam-

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Brunner offers every condensing unit you need for any air conditioning or refrigeration installation . . . large or small. In the commercial range, Open-Type units are available from ½ H.P. to 10 H.P. . . . and for bigger capacity requirements, Brunner provides a complete range of sizes from 7½ H.P. through 100 H.P. in the new NR series.

The complete Brunner line makes it easy for you to specify the right unit for every job. We furnish complete engineering data . . . as well as consultation service, if desired.

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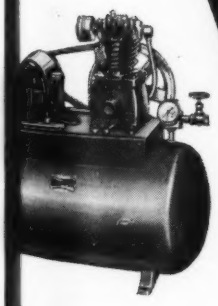

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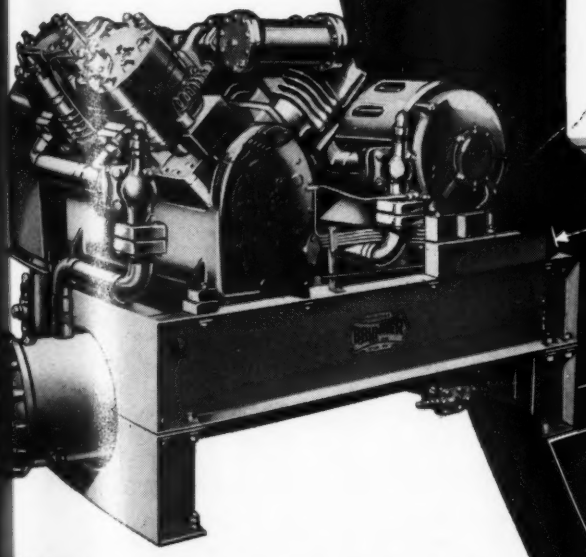
s, ¼ H.P. through 50 H.P.



ner Series NR Open-Type Condensing Unit
r a wide range of capacity requirements
7½ H.P. through 100 H.P. Other open-type
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Call these Brunner District Offices for Air Conditioning and Refrigeration Consultation Service

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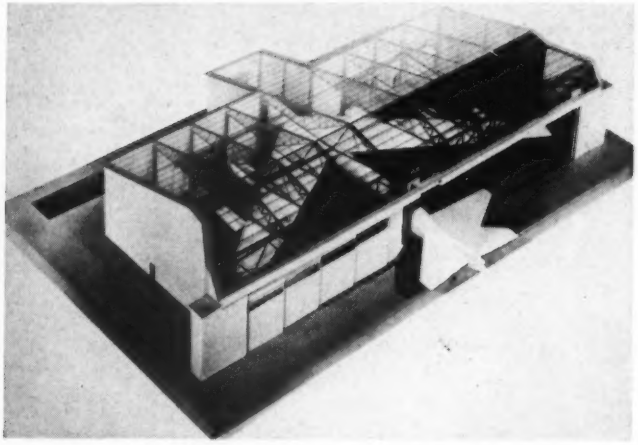


CUT-AWAY MODEL SHOWS STEEL SKELETON, WITH B-52 IN POSITION FOR MAINTENANCE.

ily" concept as a multi-usage dock for aircraft of various configurations, and will accommodate the B-52, C-124, C-133, and the KC-135. It is also capable of housing several B-58's. The dock is fitted with specially tailored, movable platforms made to fit each aircraft in the "family."

The first unit, erected at the Carswell Base, in Texas, is 85-ft deep, with a projecting nose section 30-ft deep. The clear span door opening is 198-ft wide and 28½-ft high. Tail gate section has a 32-ft clearance. Roofs and sidewalls are of galvanized steel sheets, insulated with rigid glass fiber panels.

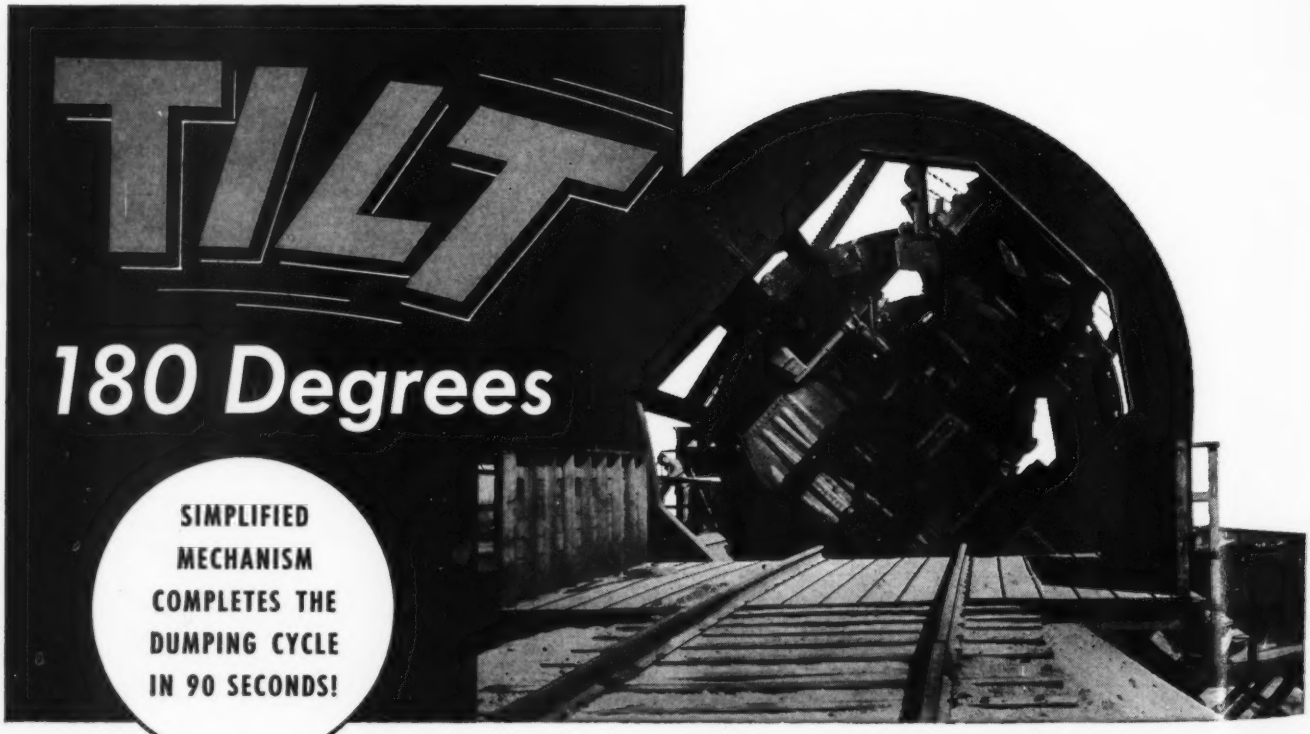
Facilities in the hanger include an electrically operated bridge crane for removal of engines; a built-in carbon dioxide fire extinguishing system; engine removal doors; and sidewall illumination through glass fiber panels. The complete structure with equipment can be finished in less than two months.

Confetti Is Used To Study Water Turbulence

Confetti blown through an elaborate plastic model at the University of Michigan is helping civil engineers find out how a planned $6 million pumping station can best handle a billion gallons of Detroit's drinking water every day. The 6-ft long, 4-ft high model represents an underground facility to be built in Detroit's Waterworks Park, on the main intake line from the Detroit River.

The confetti is carried through the model on a fast stream of air that simulates the water that will pass through the station. By watching through the clear plastic walls of the model, engineers can spot turbulent eddies and devise means to eliminate them.

The proposed station will boost water 25 feet from the main conduit for the Belle Isle intake station. From the new station, the water will flow downhill



RAILROAD CAR DUMPERS by EASTERN

■ *Write for Bulletin 200*

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The 16,000 users of YARWAY Blow-Off Valves include utilities, industrial plants, institutions and government installations—well-known plants and plants you've never heard of; large plants, small plants; with boilers of every pressure rating.

But there's one thing these companies have in common—*dependable blow-down service.* Their YARWAY Blow-Off Valves give them advanced engineering design, improved metallurgy, careful workmanship, exacting test standards and experienced field service.

On blow-off valves, *go* YARWAY—*with confidence.*

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Western Reg'l Lab. Dept. of Agriculture

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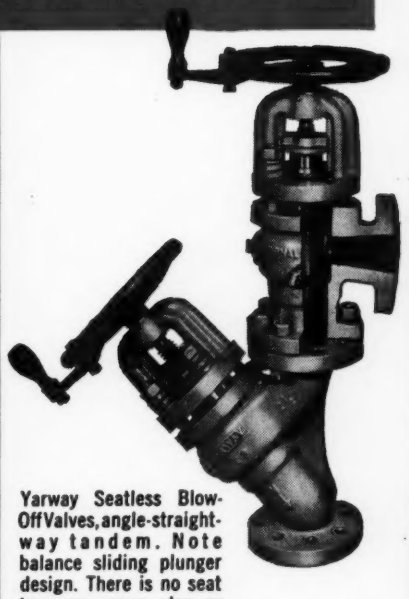

Yarway Seatless Blow-Off Valves, angle-straight-way tandem. Note balance sliding plunger design. There is no seat to score, wear, clog or leak. Write for Bulletin B-426.

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Aerovent builds 'em BIG!

"WE BUILD THE FANS TO FIT YOUR PLANS!"

Yes . . . in Duct Fans, as in all types of air-moving equipment, Aerovent offers a size for every standard industrial installation (and special applications to order).

Illustrated above is a huge 84" Duct Fan . . . one of 24 built by Aerovent for The Consolidated Edison Company for installation in its Arthur Kill and Astoria Generating Stations. These fans, with 20 H.P. motors turning 580 RPM, move air against resistance at the rate of 100,000 CFM. Other Aerovent units are available in sizes from 12" to 96" for capacities to 145,000 CFM.

Aerovent Duct Fans . . . direct-driven for standard applications or belt-driven for conditions requiring motor outside airstream . . . may be ordered with special duty motors, alloy propellers and special protective coatings for extreme temperature, moisture or corrosive conditions.

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DUCT FANS FOR ALL INDUSTRIAL REQUIREMENTS

Direct-Driven Duct
For installations which permit connection of entire fan assembly in air-stream. For vertical or horizontal use. 12" to 96".

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Used for corrosive or high-temperature conditions, which require motor to be outside airstream. 2, 4, 6 or 7 blades. 12" to 96".

"Bi-Flo" Duct
For pressures in the 1½" to 4½" range. New 7-blade "Machete" Airfoil Propellers move more air with lower horsepower. 18" to 48".

"EFFICIENCY-ENGINEERED" equipment for every air-handling problem!

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to Detroit's Northeast and Springwells filtering plants, about 7 and 11 miles away, respectively.

Water will enter the station through a 14-ft conduit, and then drop into a crescent-shaped concrete pit 16-ft deep and 90-ft long. From there four pumps will send the water along the line.

By measuring air pressure at points in the model, and by tossing confetti into the air stream, engineers can tell how effective each of their design changes has been. So far, the $20,000 model has made possible savings of over $100,000 in capitalized pumping costs by showing ways to conserve the energy of the water while reducing its turbulence. Prof. Victor L. Streeter, head of the U of M project, is acting as a consultant to Ayres, Lewis, Norris and May, Ann Arbor firm that holds the design contract.

Deadline Extended for Certification Without Examination

The American Sanitary Engineering Intersociety Board has extended to October 1st the deadline date for receipt of applications to be considered for certification without examination. The extension was adopted to permit members of the American Institute of Chemical Engineers, recently voted a sponsor of the Board, an opportunity to take advantage of the certification without examination. An invitation has been sent to the American Industrial Hygiene Association to become a sponsor. The new deadline would also make it possible for members of this group to take advantage of the "no examination" period.

Representatives of AIChE elected to the Board of Trustees are: Larry W. L. Faith, Air Pollution Foundation; R. F. Weston, Weston, Eckenfelder & Associates; and K. S. Watson, General Electric Co.

Of the 150 applications reviewed by the Board at its April meeting, 100 were accepted for certification without examination. The total certified without examination to date is approximately 300.

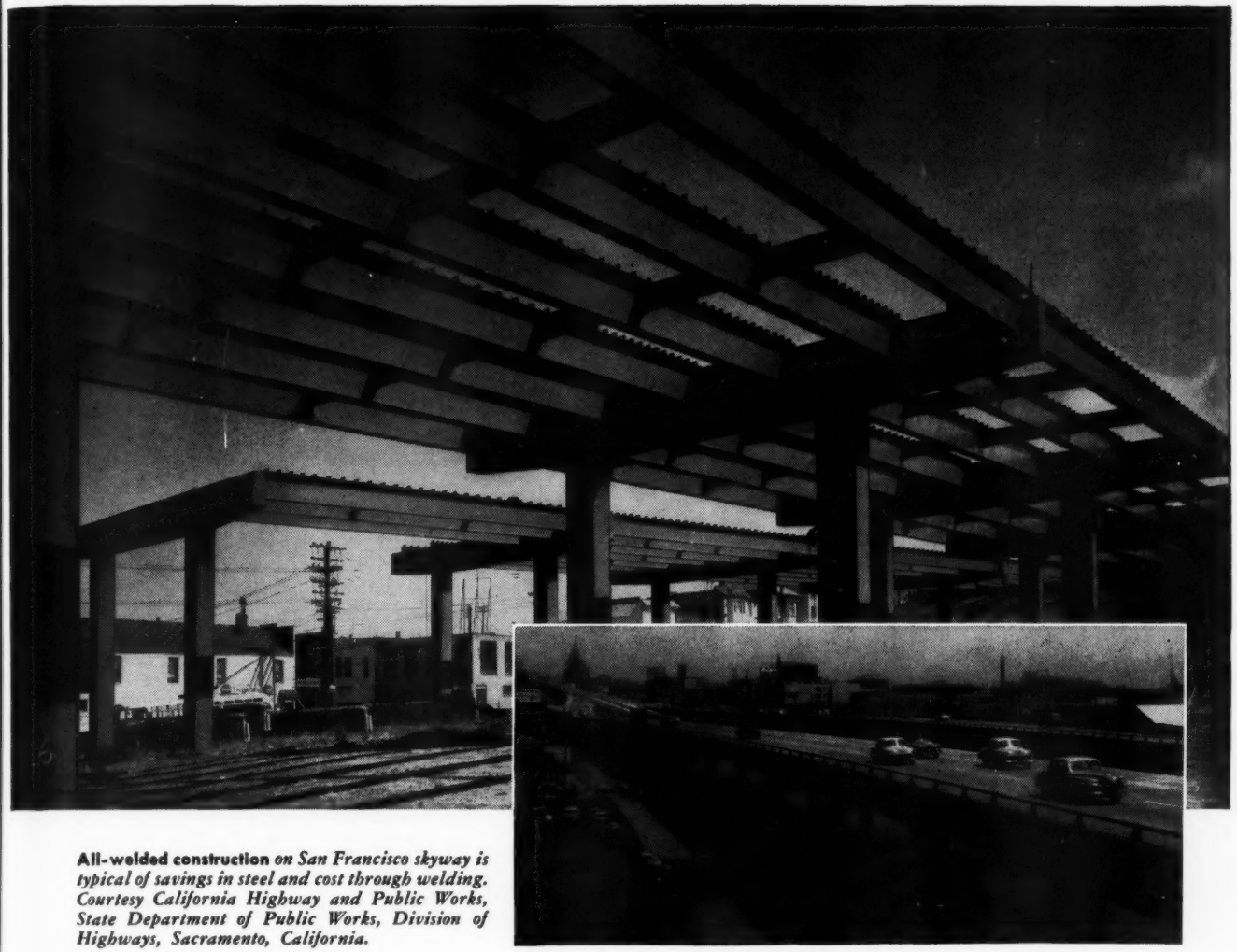
A change in the specialties to be carried on the certificates (and represented in the written examinations) recognizes a general category "Sanitary Engineer," including five specialties: Public Health, Air Pollution Control, Industrial Hygiene, Radiation Hygiene and Hazard Control, and Water Supply and Waste Water Disposal.

Cleveland Starts Construction Of Engineering Center

Although the Building Fund campaign is still short of its goal, the Cleveland Engineering Society has decided to go ahead with construction of the $1,525,000 Cleveland Engineering and Scientific Center.

The Cleveland Trust Company has offered a loan of up to $600,000 of the $650,000 the campaign fell short of its goal. During the period of construction, an intensive campaign will be waged to raise the additional $650,000.

The Center will have approximately 50,000 square feet of floor space, about three times the



All-welded construction *on San Francisco skyway is typical of savings in steel and cost through welding. Courtesy California Highway and Public Works, State Department of Public Works, Division of Highways, Sacramento, California.*

TAKES LESS STEEL...COSTS LESS

...because it's welded

Savings averaging 15% to 20% in steel requirements are being realized through the use of welding by state bridge programs throughout the country.

Increasing use of welded design comes through the change from through-type to deck-type bridges that incorporate component construction. Greater economy of material is attained since full sections of steel are used. No reductions in sections are necessary as with riveted designs. When continuous designs are utilized, overall depth of bridge deck can be reduced affording greater head room at appreciable savings.

STRUCTURAL ENGINEERS!

New 11th Edition Procedure Handbook of Arc Welding Design and Practice has completely revised 466-page section giving latest developments in structural design. Available at small cost. Write . . .

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The World's Largest manufacturer of Arc Welding Equipment

When welding saves steel

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WHY use anything but welded construction

So SIMPLE that "Specials" are Likely to be Standard!

A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol

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LIQUID LEVEL CONTROL

Because of the utter simplicity of Magnetrol's magnetic operating principle, standard models can be easily adapted to meet any special requirements for pressure, temperature or corrosive liquids . . . and usually at little extra cost. This Magnetrol versatility has solved all kinds of tough level control problems . . . and given our engineers wide application experience that can be invaluable to you.

Magnetrol is so simple that failure is all but impossible! Using only permanent, unfailing magnetic force for its operation, there's nothing to wear out . . . no diaphragms or bellows to stiffen and rupture . . . no electrodes to short or corrode . . . no packing to bind or leak. Magnetrol is practically maintenance-free! Magnetrol units are available for controlling level changes from .0025-in. to 150-ft. . . . with multi-stage switching when desired. Send coupon for full details.

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Please send me catalog data and full information on Magnetrol Liquid Level Controls. 6

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space available in the present building. It will have an auditorium seating 900; a slanted-floor auditorium to accommodate 150; a main dining room serving 350, and three special dining-meeting rooms and class rooms. The auditorium, and an adjacent future dining room, are designed for heavy loading for exhibition purposes. Office space is provided for societies, and for mailing and duplication services.

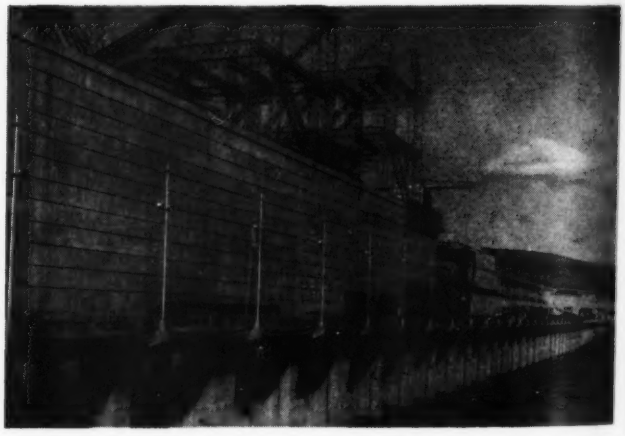
Consulting engineering work is under the direction of Osborn Engineering Co. Architects are Garfield, Harris, Schafer, Flynn and Williams.

Install Heat Pump At Dalles Dam

A heat pump installation using Columbia River generator cooling water as a heat source will provide year around air conditioning and heating for the powerhouse at the new Dallas Dam, in Oregon.

Scheduled for completion in 1960, the Dalles Dam project will cost an estimated $260 million. The dam will be 8700 feet long, 280 feet high, and will back up water for 31 miles.

Selection of the air-conditioning system was based on successful results at a sister installation, McNary

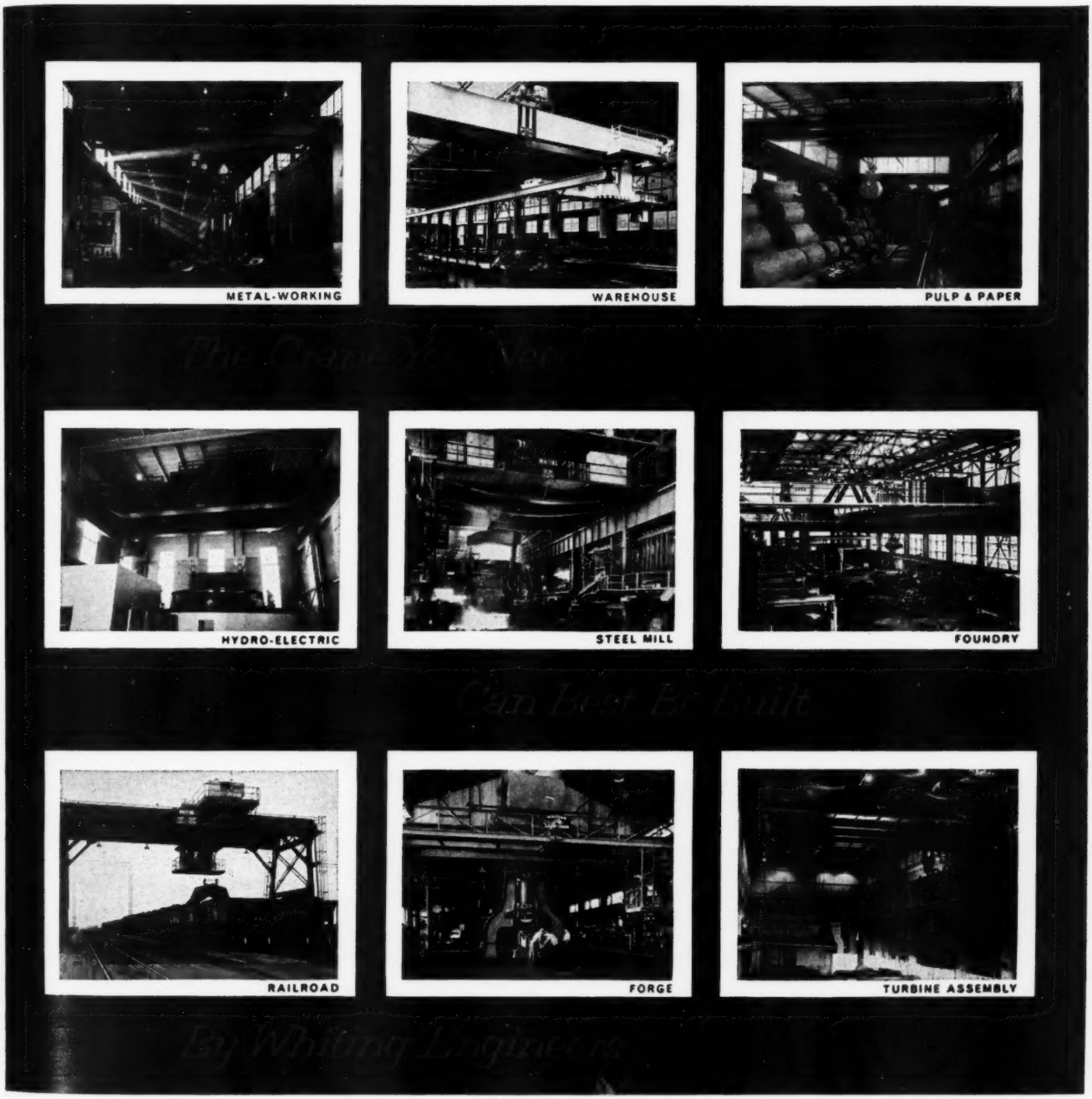


WHEN COMPLETED, DAM WILL BE 8700 FT LONG, 290 FT HIGH, AND BACK UP 31 MILES OF WATER.

Dam, near Umatilla. The first heat pump installation of its type, the McNary system has been in operation for about one year. Both installations were designed by the Corps of Engineers.

Principal components will be three 150-hp CenTraVac hermetic centrifugal refrigeration units, made by the Trane Co. Approximately 500 tons of refrigeration will be provided by the system when operating at full capacity. Design temperature for the generator room is 50 F, with 70 F provided for the remainder of the powerhouse.

Initial starting of the heat pump system is manual, with the operator determining the number of refrigeration units to be run at a given time. Once the system is operating, an outside anticipator control automatically turns off the units when no heating or cooling is necessary and starts them again when the temperature changes.



What kind of crane will assure you of peak performance and lowest cost? Whiting engineers know. For over 70 years Whiting has designed and built cranes for every industry. Whiting engineers have the imagination and experience to visualize new solutions to your materials handling problems. On the job, they closely supervise every phase of assembly and installation. They are always available for counsel and assistance—even after your crane has been in service for years. Get the full benefits of broad experience, practical imagination, thorough follow-through—call in a Whiting engineer at the "talking stage" of your new crane.

Write for Bulletin 80.

Read the story of "Whiting Engineered Cranes."

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A NEW BULLETIN ON quiet-operating

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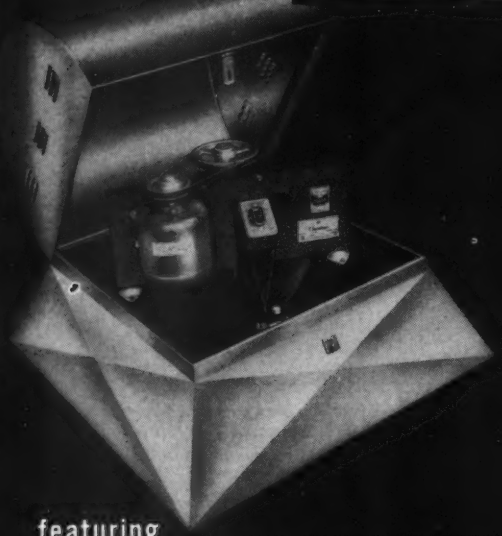

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On the heating cycle, river water will be used to cool 14 generators. In doing so, the water will pick up heat, raising the water temperature to 66 F. As this water flows through the CenTraVacs, the heat will be removed and used to heat air to 105 F for delivery to air handling units.

On the cooling cycle, river water will flow through the CenTraVacs to pick up the powerhouse heat and carry it away.

The Dalles Dam is part of a plan for development of water resourses of the Columbia River and its various tributaries.

Five States Standardize Engineer-in-Training Tests

Standardized examinations for Engineers in Training now will be given by North Dakota, Minnesota, Kansas, Iowa, and Missouri.

According to "NDACE Notes," new publication of the North Dakota Association of Consulting Engineers, the following new examination requirements for registration as a professional engineer have been adopted by the North Dakota group:

All persons seeking Professional Engineer registration will write a 16-hour examination, instead of the present 8-hour exam. The test will be given in two sections — one on fundamentals and the other on professional engineering.

The fundamentals test may be taken at any time after graduation, but prior to the professional engineering exam. On applications filed after Jan. 1, 1958, the fundamentals test (or EIT exam) will be required of all desiring registration in North Dakota.

IACE Goes to Bat For Member in Court Case

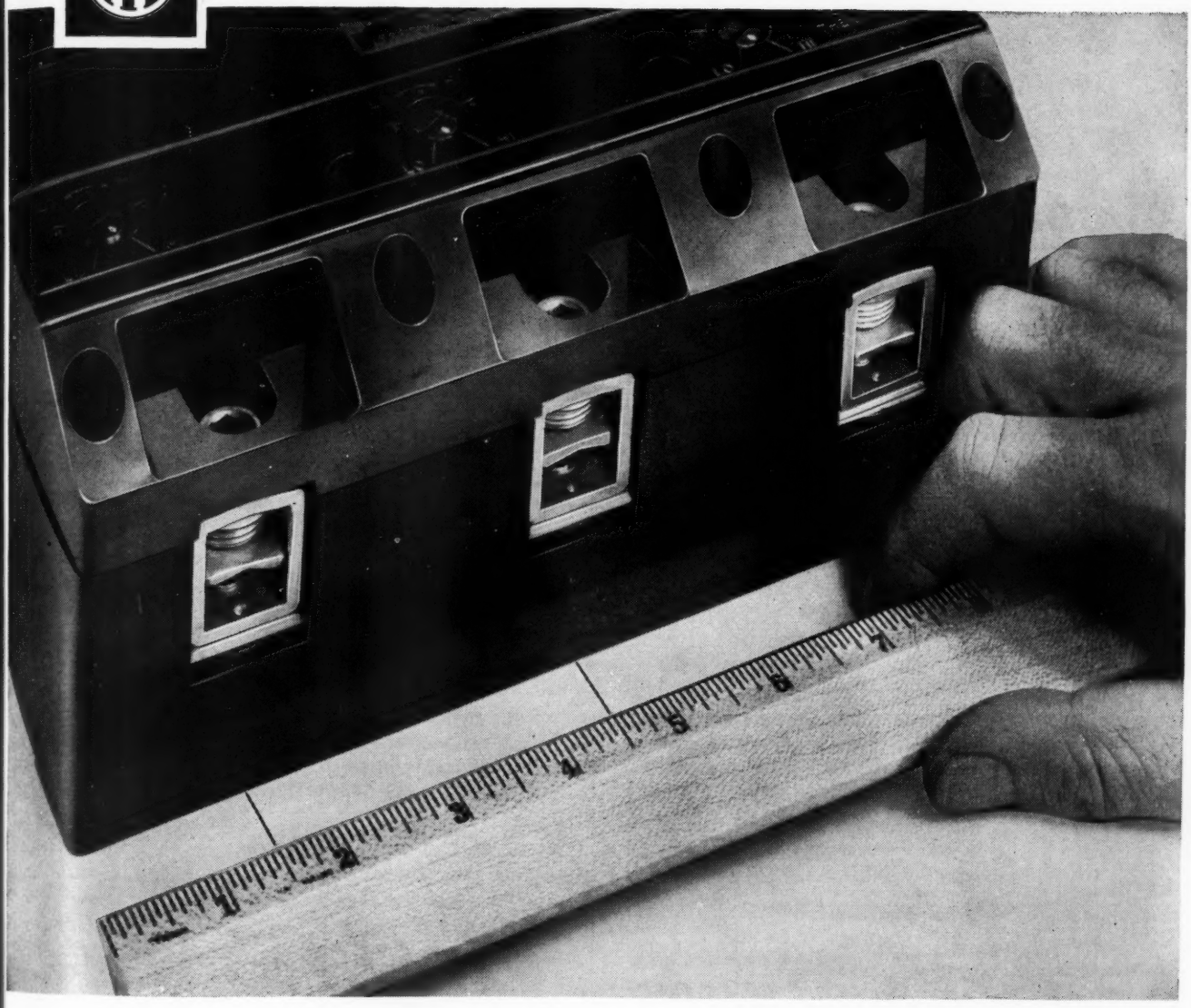
Officers of the Illinois Association of Consulting Engineers are proposing that the IACE act as *amicus curiae*, a Friend of the Court, in the case of Beling vs. the City of East Moline.

Earl Beling, an IACE member, contracted with the City of East Moline to design and supervise construction of a waterworks system. The city council adopted an ordinance authorizing the improvement and providing for issuance of water revenue bonds. After scheduling the project the city later terminated the contract and repealed the ordinance without having issued any bonds. Subsequently, another engineer was employed for substantially the same work.

The original contract provided that 10 sets of plans prepared by Beling be furnished the city, and this was done. The city in its defense claimed that no appropriation ordinance pertaining to this contract was adopted and therefore Beling is barred from recovery. The city was upheld in both the trial and in the Appellate Court.

In a detailed analysis of the case, attorney Walter G. Hagemeyer, a registered professional engineer, characterized the Appellate Court's action as "an

MOLDED CASE CIRCUIT BREAKERS



I-T-E Molded Case Circuit Breakers Have Extra-Wide Pole Spacing

In most circuit breaker applications, the extra-wide pole spacing in I-T-E circuit breakers could be important to you for at least three reasons:

1. Gives added safety
2. Facilitates installation
3. Breaker design permits sturdier construction

Minimum spacing between I-T-E pole centers is 1½ in.—3 in. in all larger breakers. Thus I-T-E molded case circuit breakers give you the maximum in design as well as in performance.

ALL TERMINALS ARE ENCLOSED

An additional design feature of I-T-E molded case circuit breakers is the completely enclosed terminal—no live parts are exposed which can accidentally be touched by the hand.

Wider pole spacing and enclosed terminals are but two built-in advantages which contribute added value to you—at no extra cost. Contact your nearest I-T-E representative for details.

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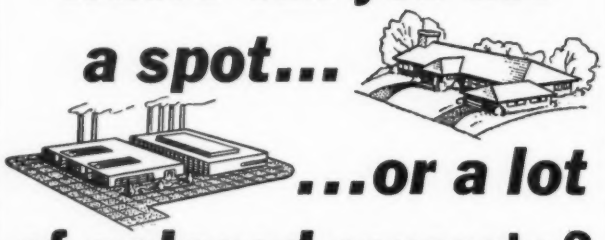
IN CANADA: EASTERN POWER DEVICES, LTD.

Where can you use a spot... ...or a lot of colored concrete?



Do you know that colored concrete has functional as well as aesthetic value? You can use colored concrete to guide traffic, delineate working areas and set off hazard zones. And do you know that Horn coloring products enable you to do this economically?

For example, *Horn Colorundum* is easily dusted on and trowelled into freshly poured concrete—where it assures long-lasting hardness and resistance to abrasion. It's a lime-proof, sun-proof finish. Or you can use *Horn Staybrite.* It's packaged in pre-measured quantities, easily mixed integrally with the cement or mortar—another ideal product which enhances the beauty of all concrete and mortar surfaces.

Like to know more about using colored concrete functionally? Write for details to Dept. H62-6100.

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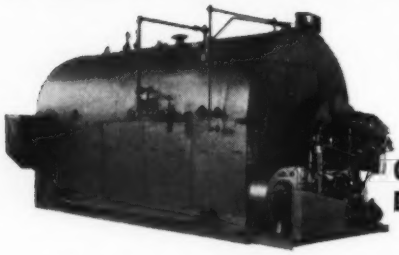

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CHECK THESE TOP-QUALITY FEATURES:

- Off-center firing with rotary combustion
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- One unit, self-contained
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- Factory tested, proved

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Equivalent Hp.	20	25	30	40	50	70	80	100
Sq. ft. Water Heat. Surf.	112	129	151	201	300	356	418	510
Lbs. Steam per Hr.	700	863	1035	1380	2070	2450	2760	3500
Equivalent Hp.	125	150	180	200	250	300	400	500
Sq. ft. Water Heat. Surf.	650	814	905	1000	1252	1500	2000	2500
Lbs. Steam per Hr.	4400	5200	6210	6900	8639	10,350	14,000	17,500

WRITE NOW FOR SPECIFICATIONS AND BULLETIN EC-657-CE

Dutton BOILERS DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO, MICHIGAN • BOILER BUILDERS SINCE 1880

Also Manufacturers of Hapman Bulk Materials Conveyors.

erroneous decision and does not follow the decisions cited in the case which are in point and in effect says that the cited cases are now the law." He cited a section of Illinois law relating to cities, villages, and municipal corporations relating to the employment of persons, including engineers, in the construction of a public work or improvement to be paid out of a special fund and then quotes this language: "... and the municipality thereafter abandons the public work or improvement, it becomes liable for the service rendered out of its general funds. The persons rendering services are not required to look for payment to the special fund which may be nonexistent."

A petition for a re-hearing in the Appellate Court has been filed, but has not been acted on as yet. Attorney Hagemeyer presently is studying the Illinois Professional Engineer Act with a view towards making recommendations for possible changes.

NSPE Opposes Change in DC Registration Act

The National Society of Professional Engineers has joined its District of Columbia Society in opposition to several bills recently introduced in Congress which would, in effect, permit master electricians and electrical contractors to plan and diagram all types and sizes of electrical projects in the District without being registered as professional engineers.

The proposed legislation (S. 1909 and H. R. 6942 and 6986) introduced by Senators James G. Beall and John Butler, and Representatives Richard E. Lankford and DeWitt S. Hyde, all of Maryland, would amend the D.C. Professional Engineers' Registration Act by exempting master electricians and electrical contractors from the Act.

The D.C. Registration Act, adopted by Congress in 1950, presently requires that professional engineers do all electrical engineering design work.

A suit has been filed by the Electrical Contractors Association of Washington to declare illegal certain regulations under the local electrical code which require electrical engineers, rather than electricians, to plan and design projects exceeding 200 amperes.

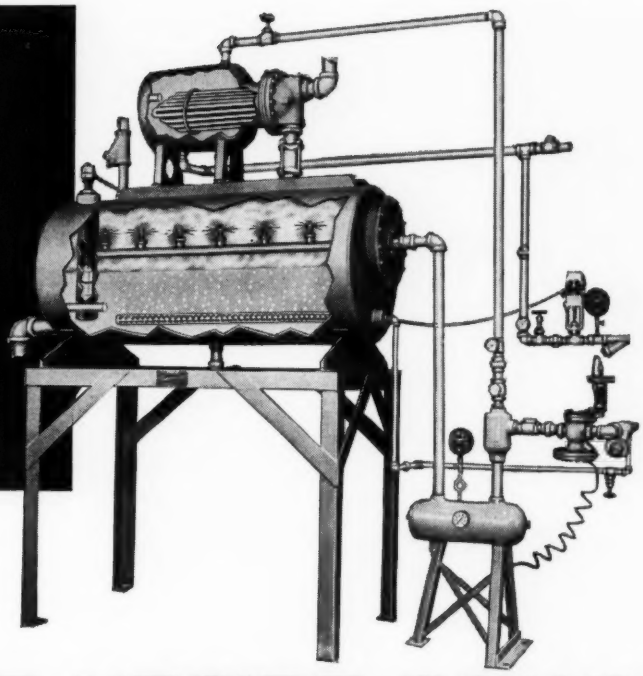
In a memorandum to each of its affiliated state societies having Congressmen on the House or Senate District of Columbia Committees, the National Society pointed out that "proposals of this type could establish a dangerous precedent by allowing an exemption from a registration law for certain persons and that opponents of registration in the various states might seek to justify similar exemptions under state laws."

The National Society urged its state societies to write their appropriate Congressmen, declaring NSPE's opposition to these bills, and pointing out that the bills present "a serious threat to public health, welfare, and safety in that persons who have not proved their competence for engineering by registration would be permitted to plan and diagram projects to which the public is daily exposed."

The National Society has contacted both the Senate and House District of Columbia Committees and

SCHAUB

ZERO-OXYGEN DEAERATOR



TURNING AN OLD PRINCIPLE UPSIDE DOWN

Comes Up with a Better, Simpler Deaeration System

That is exactly what Schaub engineers did when they first designed the Schaub Zero-Oxygen Deaerator.

THE RESULT: An entirely new and simpler kind of boiler feedwater deaerator that insures complete oxygen removal (to .005 cc/liter) under all conditions and wide load variations—with excellent thermal economy. Add to this, lowest maintenance, plus complete safety and utmost dependability.

Basic differences that give Schaub Zero-Oxygen Deaerators their more effective performance are: 1) *external pre-heating* to a temperature *well above* boiling point within the deaerator; 2) explosive flash-down release of dissolved gases; 3) *unrestricted venting* through a special type vent condenser for faster *complete* release of liberated gases, without wasteful excess steam vapor losses.

By delivering *superheated* water into the fully vented tank, the hitherto critical problem of "matching" temperature to the *"full"* boiling point at the pressure within the deaerator is entirely eliminated. (This has been a major stumbling block with conventional deaerator design.) Passing through multiple, specially designed spray nozzles, incoming water "flashes down" in an explosive action that effectively liberates oxygen, CO_2 and all other non-condensible gases.

Also with unrestricted venting there is no need for premium-cost pressure shell. No pressure relief valve, overflow trap or orifice adjustment is ever required. Rust-proof Chromosoid lining insures extra-long life.

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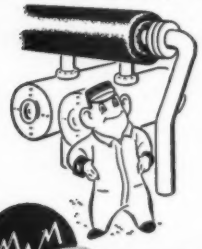

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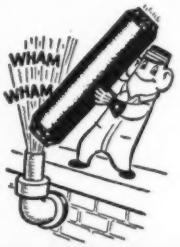

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requested that it be kept advised of the status and progress of these bills, and that it be notified of any scheduled hearings.

High School Utilities All Carried In Tunnel

Falk and Booth, San Francisco, Calif., supplied the structural engineering and architectural service for the new Lodi Union High School, Lodi, Calif., which will soon be completed after 1½ years construction. It is a steel frame and concrete block masonry structure with glued laminated wooden girders over the gymnasium. The buildings, with 181,000 sq ft area, cost $2,720,000, with mechanical and electrical installations approximating $590,000. Dan Vandament was the mechanical engineer, and Harold Gerber the electrical engineer on this project. One of the unique features of this high school was concentration of all utilities in a large connecting tunnel with ample room for a workman to walk through in making inspections or repairs.

Protest Union Label On Engineering Plans

At a hearing on April 3 before the Los Angeles Board of Public Works, Pecos H. Callahan, executive secretary of the Consulting Engineers Association of California, presented a statement from the Association in opposition to the placing of any insignia on engineering plans other than that required by law. The hearing by the Board grew out of a rejection of plans presented in a bid on which the union label of the American Federation of Technical Engineers had been placed.

The statement by the Consulting Engineers Association opposing the placing of the union label or any other insignia on plans was based on four fundamental principles: (1) under the laws of the State of California, the responsibility for engineering designs and plans is vested in the registered engineer signing the plans and no other individual or organization has any responsibility therefor, and any additional insignia or information on the plans would imply divided responsibility; (2) engineering plans are a result of professional attainment and preparation, and any unnecessary stamp, label, or other similar marking has no significance as to the competency of the designer or the adequacy of the plans; (3) the only purpose of any insignia on the plans, other than the signature of the registered engineer, would be to advertise an organization, and it would not be appropriate that such advertising appear on engineering plans or public records; and (4) if the practice were permitted, the end result would be the placement of innumerable insignia of various organizations on the plans, resulting in confusion and detraction from the main purpose.

The hearing was held before Admiral Cushing Phillips, president of the Board, and commissioners

Leo M. Strabel, Edward J. Cox, Arch L. Field, and Edward A. Hawkins.

Appearing for labor were Chas. H. Lang, representing Chas. Bassett, secretary of the Labor Council; Wm. Gilbert, representing the National AFL-CIO; and Ted Brand, of the Los Angeles CIO Industrial Council. They charged the opposition with being anti-union, and answered the question of the possibility of secondary boycott by promising that no such action would be taken by the unions.

Others opposing the use of the union label on plans included: Pat O'Donovan, secretary of the Construction Industries Committee and the Engineering and Architects Consultant Committee, Los Angeles Chamber of Commerce; C. R. Leslie, attorney for the Merchants and Manufacturers Association, who pointed out that the union label had been used in many instances as a trigger for secondary boycotts; C. M. Deasy, president of the American Institute of Architects, who referred to the fact that architects and professional engineers are licensed by the State of California and are authorized to affix their signature and seal to drawings and no other insignia is required; C. P. Von Herzen, secretary of the Professional Coordinating Council of Los Angeles County, representing nearly all professions in the area; C. M. Gould, attorney, who spoke for Mr. White, executive secretary, California Council of Civil Engineers and Land Surveyors; Ralph Westcott, president of the Consulting Engineers Association of California; Harvey Mylander, president of the Pasadena Chapter, California Society of Professional Engineers; George Brandow, president of California Legislative Council of Professional Engineers; J. Douglass Locke, executive secretary of the State Board of Registration for Civil and Professional Engineers; Ray Spencer, Los Angeles Section, American Society of Civil Engineers; and Captain Coryell, Society of American Military Engineers.

Short Summer Courses Offered by MIT

The Massachusetts Institute of Technology is offering the following summer programs of special interest to consulting engineers. Further information is available from Office of the Summer Session, Room 7-103, MIT, Cambridge 39, Mass.

Starting June 11:
- Soil Engineering in Frost Areas (two weeks)

Starting July 8:
- Structural Sandwich Design (two weeks)
- Principles of Radioisotope Utilization (two weeks)

Starting July 15:
- Photogrammetric Engineering (two weeks)
- Editing Technical Reports (one week)

Starting July 22:
- City and Regional Planning (two weeks)

Starting August 12:
- Fundamentals of Noise Reduction (one week)

Starting August 19:
- New Advances in Noise Reduction (one week)

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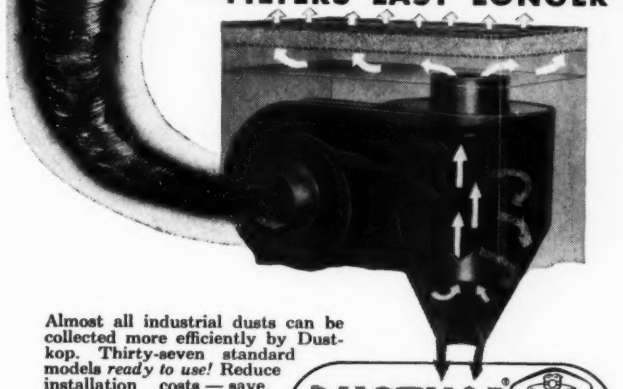

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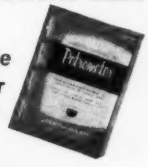

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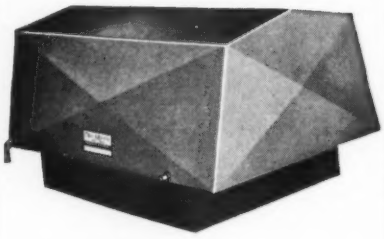

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Men in Engineering

Anthony F. Haven has opened offices at 206 South Main St., Ann Arbor, Mich. He will be affiliated with Albert & Knowles, Consulting Engineers, of that city. Haven was chief structural engineer for Cummins & Barnard, Inc., of Ann Arbor, for eight years, and for the last two years, senior structural engineer for Smith, Hinchman, Grylls Associates, Inc., Detroit.

The Consulting Engineers Association of Georgia has elected L. Ralph Bush, of L. Ralph Bush & Associates, of Atlanta, Ga., as president. Vice president is R. Berl Elder, consulting electrical engineer, Macon; and secretary-treasurer is T. Z. Chastian, consulting structural engineer, Atlanta. Directors are O. Kenneth Lewis, Jr., consulting mechanical engineer, Albany; Benjamin S. Persons, Dames & Moore, Atlanta; Sommers J. Gostin, Winchester & Gostin, Macon; and Arthur G. Gautreaux, consulting engineer, Savannah. Benjamin Persons is alternate director to the Consulting Engineers Council and R. Berl Elder is director to the Consulting Engineers Council.

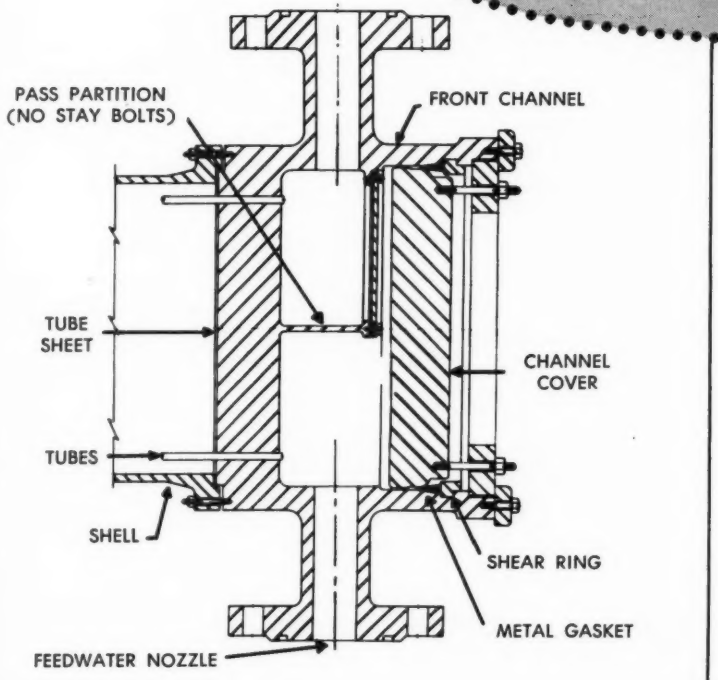
The Membership Committee, headed by J. Tom Mundy, of Brewer & Mundy Engineering Co., Atlanta, is preparing material for an active membership campaign with the assistance of John E. Anderson, of Atlanta.

Three prominent California consulting engineers discussed "Construction on Tidelands" at the April meeting of the California Structural Engineers Association. Chief engineer of Woodward, Clyde & Associates, Stanley Gizienski, led the panel with an analysis of preliminary studies and problems and the geological history of the tidelands. Robert Lawson, Dames & Moore engineer, pointed out the different types of fills and inherent problems in each. William Brewer, head of Brewer & Associates, pointed out the problems of actually planning industrial type structures on the site and the details to be considered. Oliver

Study Airports

Earle Rader, Rader and Assoc., Miami, describes Birmingham Airport expansion project to four Japanese aviation engineers spending a month at the firm studying airport design. Employed by Japan Civil Aviation Bureau, they are in the U. S. under the Technical Assistance Program. L. to r., T. Saito, K. Hayashi, S. Shibata, and H. Mori.

What a difference!



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**Mr. Entropy represents the heat that is produced but unavailable for use.*

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Merwin, Dames & Moore, was the moderator of the panel.

Robert K. Lockwood has been promoted to assistant to the executive secretary of the American Society of Civil Engineers. H. W. Hunt has been named executive editor of the Society's official magazine, *Civil Engineering.*

A new firm has been formed in Cincinnati, Ohio, under the name of P. H. Ziel & Associates. Specializing in mechanical and electrical work, the members of the firm have had extensive experience in adaptation of high temperature water systems for heating.

At the Annual Meeting of the Gulf Institute of Consulting Engineers, held in Baton Rouge, La., Louis N. Goodman, of Louis N. Goodman and Associates, Consulting Engineers, New Orleans, La., was elected president. Leo S. Weil, of Weil and Moses, Consulting Engineers, New Orleans, is first vice president; B. M. Dornblatt, B. M. Dornblatt and Associates, Inc., New Orleans, is second vice president; and G. A. Heft, G. A. Heft & Co., New Orleans, sec'y-treas.

Two well known Seattle, Wash., architectural and engineering offices will join forces under the name of Nickum, Lamont and Fey, according to an announcement by the principals, George C. Nickum, managing partner of W. C. Nickum and Sons, and Daniel Lamont and Lester Fey, of Lamont and Fey. Offices will be at 71 Columbia St., Seattle. W. C. Nickum and Sons will continue to carry on marine design work under their original name.

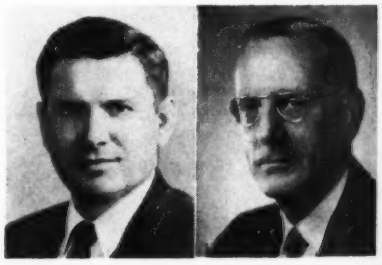
Edward B. Moebus and Samuel B. Roberts have been elected to the position of vice presidents of Lockwood Greene Engineers, Inc. Both men have their offices in New York City.

Two firms have consolidated under the name of Adams, Morgan, Latham, Kripp & Wright, Architects & Engineers. The new firm is made up of Charles P. Morgan & Associates, Inc. and Morgan & Adams, Fred G. Adams. Associates in the new organization are G. Scott Robertson, Jr., Jean R. Cook, and George K. Kobayashi. Offices are at 608 F&M Building, 320 Pine Ave., Long Beach, Calif.

Edward E. Slowter has been elected vice president of Battelle Memorial Institute, of Columbus, Ohio. A member of the Institute's technical and executive staff since 1936, Slowter has been the Foundation's secretary and business manager.

Gerhard K. Wisser, after two years of military service, has returned to the electrical department of Gibbs & Hill, Inc., New York City.

Charles L. Nichols, formerly chief engineer in the Los Angeles office of Dames & Moore, soils mechanics engineers, has been made an Associate. Malcolm D. Horton, who has been serving as a staff engineer in the L.A. area, has been promoted to chief engineer.



NICHOLS PHELPS

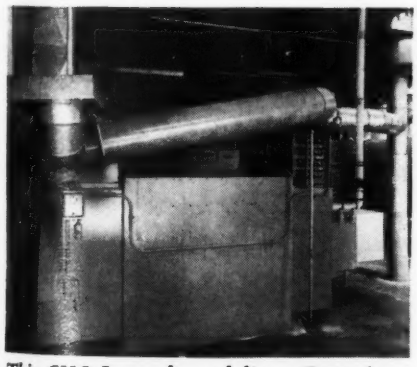
D. Maynard Phelps, professor of marketing, University of Michigan, is the new president of the American Marketing Association. Wendell R. Smith, Partner in the firm of Alderson & Sessions, Philadelphia, is president-elect.

J. Stephen Watkins, consulting engineers, of Lexington, Ky., have opened an office at 4724 Preston St. Highway, Louisville, Ky., to handle highway engineering only. The new office will be under the resident direction of C. W. Lovell. The partnership offices of J. Stephens Watkins & Robert E. Martin, at the same address, will continue to handle sanitary and civil engineering. The new office at 107 Hale St., in Charleston, W. Va., will be under the resident direction of M. R. Hamill. ▲▲

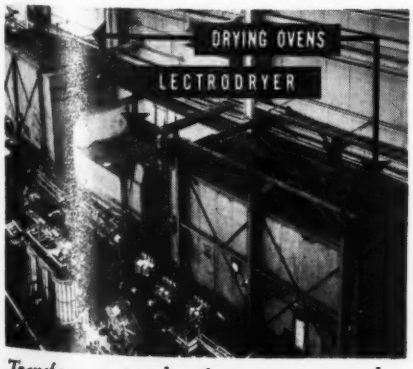
Ampoules are filled in DRY *box at right and sealed in near room, held at 10% relative humidity by a Type CH Lectrodryer.*

Are you just living with your moisture problems?

Lectrodryer can relieve those worries*



This CHO Lectrodryer delivers DRY *air on a continuous basis, 14 hours per day, to a sugar conveyor system in a candy factory.*



*Transformer production was more than doubled—*DRY*ing time reduced from 92 to 32 hours—when a manufacturer fed* DRY *air to these ovens.*

MOISTURE gums-up materials in storage—makes handling difficult and destroys them. Processes are slowed down and even stopped. Recognize that unwanted moisture is causing your troubles and you've gone a long way toward eliminating them.

Maintaining DRYness in dry boxes where pharmaceuticals are packaged or electronic equipment assembled presents little difficulty. In workrooms containing dozens of workers, however, you must compensate for moisture they exude, as well as leakage through walls and doorways.

Lectrodryer engineers have been solving such problems for years—advising on methods of insulating areas against moisture infiltration, then supplying controls and DRYing machines to hold humidity down.

The book, *Because Moisture Isn't Pink,* tells how others have solved their problems. For a copy, write Pittsburgh Lectrodryer Division, McGraw-Edison Company, 357 32nd St., Pittsburgh 30, Pennsylvania.

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Why Buried Piping Corrodes: External corrosion of buried piping is variously caused: *Electrolytic attack* occurs when stray direct currents find their way from a piping system to the earth, at which point pitting occurs on the pipe surface. *Galvanic attack* results from current generated when metal touches certain types of soils. *Chemical attack* may include damage by water in liquid or vapor form, earth salts, chemicals from industrial or organic wastes, or by chemicals in various insulating materials.

Gilsulate solves an old problem by surrounding the piping with a material which is a dielectric, is chemically neutral and stable, is a *natural* insulator and which, in the case of buried hot piping, also forms a good vapor barrier.

No other insulation protects buried hot piping completely! Gilsulate is the only insulation which can provide the three *vital* means of protection, and also withstand the destructive forces of burial in the earth. It is physically and chemically stable. It will not dissolve, crush or rot. It is not rigid; therefore, ground and pipe movement will not destroy its effectiveness.

8 Reasons to use and specify GILSULATE

1. IT IS A NATURAL INSULATION

Gilsulate is mined, crushed, screened and blended from pure Gilsonite mineral, a unique hydrocarbon found only in eastern Utah. No chemical or other physical change is made in the natural mineral. It is a *natural* insulation. Gilsonite is mined in an exceptionally pure state with virtually no trace minerals or foreign materials. Gilsulate is specially sized, selected and blended Gilsonites.

2. IT PROTECTS PERMANENTLY

The Gilsulate system solves the problem of insulating underground hot piping permanently—and at low cost.

3. IT CANNOT DETERIORATE

Chemically inert and stable, Gilsulate cannot change with time, moisture or soil. It is impervious to mold, fungus, bacteria, rodents, plant growth and soil chemicals. It has lain unchanged in the earth for millions of years.

4. IT IS PACKAGED FOR EASY HANDLING

Gilsulate is supplied in 2½ cu. ft. sacks. Shipping, storage and handling at the job site are easy. No bulky, heavy units requiring cranes or special tackle—practical packaging for palletized loading or manhandling to hard-to-reach piping locations.

5. ...AND IT IS ADAPTABLE AT JOB SITE

Gilsulate needs no pre-cutting, mixing, assembling or fitting. Last minute job site changes in the piping layout or arrangements will not demand special fittings or changes in the insulating equipment or methods.

6. EASILY INSTALLED

Gilsulate all but installs itself. Just pour it on...tamp it down...heat the piping...backfill. The Gilsulate fuses to form a plastic protective sheath around the pipe.

7. NO SPECIAL FORMING OR MATERIALS NEEDED

Gilsulate adjusts itself to pipe expansion; provides its own vapor barrier. No hand fitting is needed; no special vapor barriers need be installed. Usually, the trench walls and floor are the only forms needed. Sheet metal or wood slip forms may be used if trench is cut wider than the insulating envelope desired. For a single pipe, or complex multiple piping system, *installation is simple.*

8. PIPING ALWAYS EASILY ACCESSIBLE

Gilsulate structure gives the only underground piping system which can be opened and re-installed with only pick and shovel. Alterations and additions to Gilsulate-insulated systems demand no more skill than does altering a fully exposed piping system.

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By Consulting Engineers —

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A. E. Heagler, Little Rock, Ark.
Drainage and street improvements, City of Conway, Ark. (Civil) $1,350,000. Client, Mayor and City Council.

Sanitary sewer improvements, Warren, Ark. (Civil) $500,000. Client, Mayor and City Council.

Drainage and street improvements, Forrest City, Ark. (Civil) $350,000. Client, Commissioners.

CALIFORNIA

Rule, Dietze, Conkle, Los Angeles.
Central repair shop facility, Barstow, Calif. $6,500,000. Client, Bureau of Docks, U.S. Navy.

High school, Indio, Calif. $1,200,000. Client, Coachella Valley Union High School District.

Elementary schools, Torrance, Calif. $720,000. Client, Torrence Unified School District.

Green & Erskine, Menlo Park, Calif.
Design five stores. $50,000. Client, Juan Seijo, Sunnyvale, Calif.

Design four stores. $40,000. Client, Gino Pasquali, Sunnyvale, Calif.

Design branch library, Redwood City, Calif. $40,000.

Air condition Hall of Justice, San Mateo, Calif., including design of 210 T central refrigeration system. $78,000. Client, County of San Mateo, Calif.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Study of commercial and recreational navigation on waterways of Sacramento-San Joaquin Delta, Calif. Client, Corps of Engineers, Sacramento Dist.

Quinton Engineers, Ltd., Los Angeles.
Manufacturing and repair plant, 80,000 sq ft, concrete and steel, Compton, Calif. Client, Westinghouse Electric Corp., Pittsburgh, Pa.

M. Carleton Yoder, Berkeley, Calif.
Sewage treatment works for Rodeo Sanitary District, Rodeo, Calif. Design load of 1 mgd. Facilities consist of sewage lift station, force main, and treatment plant comprised of grit chamber, clarifier, sludge digestor, sludge lagoons, and control building. (Civil, struc., mech., elec.) $394,250. Client, Rodeo Sanitary District.

Arthur A. Sauer, Sacramento, Calif.
Nelson Avenue School, Thermalito, Calif. (Struc.) $190,000. Client, Koblik & Fisher, Arch.

Central School addition, Oroville, Calif. (Struc.) $88,000. Client, Koblik & Fisher, Arch.

Metal shop, Vacaville High School, Vacaville, Calif. (Struc.) $70,000. Client, Koblik & Fisher, Arch.

Fresno Community Hospital, Fresno, Calif. (Struc.) $3,500,000. Client, Alastair Simpson, Arch.

Bullard Junior High School, Fresno, Calif. (Struc.) $560,000. Client, Alastair Simpson, Arch.

Classroom addition and shop, Coalinga College, Coalinga, Calif. (Struc.) $250,000. Client, Walter Wagner, Arch.

Classroom addition, Sierra High School, near Fresno, Calif. (Struct.) $75,000. Client, Alastair Simpson, Arch.

Calwa School addition, Fresno, Calif. (Struc.) $90,000. Client, Ben Lippold.

Classroom addition, Madera Union High School, Madera, Calif. (Struc.) $80,000. Client, Charles D. James, Arch.

Stop-N-Shop Market building and shops, Unit #1, El Camino and Watt Center, Sacramento, Calif. (Struc.) $650,000. Client, Kooper & Maybach.

Daniel, Mann, Johnson & Mendenhall, Los Angeles, Calif.
Complete engineering services including design and construction surveys, plans, and specifications for sewage collection system, 4 mgd treatment plant, and disposal outfall for East San Bernardino. (Civil) $2,600,000. Client, East San Bernardino County Water District.

Cuyama Valley High School, complete services. (Civil, struc., mech., elec.) $1,800,000. Client, Santa Maria High School District.

Administrative offices for Hammermill Paper Co., in association with Rust Engineering Co., Pittsburgh, Pa. (Civil, struc., mech., elec.) $2,500,000. Client, Hammermill Paper Co.

Presbyterian Intercommunity Hospital, Whittier, Calif., in conjunction with J. Dewey Harnish, Arch., of Ontario. (Civil, struc., mech., elec.) $3,100,000. Client, Presbyterian Intercommunity Hospital Association.

Narbonne High School, Los Angeles,

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Calif. (Civil, struc., mech., elec.) $4,250,000. Client, L. A. City School Board.

James M. Fox, Huntington Park, Calif.
Design manufacturing plant, 57,000 sq ft, structural steel frame, and tilt-up walls. $400,000. Client, Norris-Thermador Corp., Vernon, Calif.

COLORADO

Davis Read, Chicago, Ill.
Coal mine, Redstone Pitkin Co., Colo. (Mining)

Clifford Johnson & Assoc., Denver.
Twin viaducts to carry Denver Valley Highway over 10 railroad tracks and South Broadway. Length, 1640-ft. (Struc.) $1,400,000. Client, Colorado Dept. of Highways.

Structures in connection with North-South Freeway through Colorado Springs, Colo., including new bridge over eight railroad tracks and Monument Creek; modifications to existing bridge parallel to above; two bridges over Fountain Creek; two twin grade separation structures. (Struc.) $750,000. Client, Colorado Dept. of Hwys.

Rocky Mountain Engineering Co., Denver, Colo.
Swimming pool, wading pool, bathhouse for Lowry Air Force Base. (Civil, struc., mech., elec.) $95,000. Client, Officers' Club, Lowry Air Force Base, Denver, Colo.

Sewage disposal and collection system. (Civil) $235,000. Client, Town of Pagosa Springs, Colo.

Sewage disposal and collection system. (Civil) $85,000. Client, Town of Naturita, Colo.

Solar distillation plant, San Diego, Colo. (Civil, struc., mech., elec.) $65,000. Client, Dept. of Interior, Office of Saline Waters, Washington, D.C.

CONNECTICUT

Morton S. Fine, Hartford, Conn.
Road design and layout, Tobey Road and Eddy Street, Bloomfield, Conn. Client, Town of Bloomfield.

Access road at Undercliff Sanatorium, Meriden, Conn. $30,000. Client, Public Works Dept., State of Conn.

Fletcher-Thompson, Inc., Bridgeport.
Plans and specifications for new building, including machine shop and assembly bay, 675-ft long, with approx. 50,000-sq-ft of floor space. $2,500,000 (est.). Client, Waterbury Farrel Foundry & Machine Co., Cheshire, Conn.

DELAWARE

Daniel Koffler, New Castle, Del.
Newark, Del., country club. One-story structure with basement; laminated arches, precast concrete block floor slabs, and radiant heating system. (Struc., mech., elec.) $110,000 (est.) Client, Howard Greenhouse, Arch., Frank Durham, associate designer.

DISTRICT OF COLUMBIA

Hayes, Seay, Mattern & Mattern, Roanoke, Va.
Service buildings for Old Soldiers, Wash., D.C. (Civil, struc., mech., elec.) $2,000,000. Client, U.S. Soldiers Home.

FLORIDA

Wolpert-Tilden & Assoc., Orlando, Fla.
Capital City Country Club, Tallahassee, Fla. Country club clubhouse and pertinent facilities. (Mech., elec., struc.) $275,000. Client, Ernest Stidolph, Arch.

Ballinger-Meserole Co., Philadelphia.
Grocery warehouse. $89,000. Client, The Lewis Bear Co., Pensacola, Fla.

U. D. Gosselin, Ocala, Fla.
Wind load and structural analysis, laminated spire, 60-ft high, 12 x 16 ft base. (Struc.) $15,000. Client, Prince of Peace Memorial, Paul Cunningham, Owner, Silver Springs, Fla.

James A. Tuck, Fort Pierce, Fla.
Courthouse and jail at Titusville, Fla. (Civil, struc., mech., elec.) $200,000. Client, State of Florida.

Armory at Cocoa. (Civil, struc., mech., elec.) $200,000. Client, State of Florida.

First Baptist Church, Cocoa. (Civil, struc., mech., elec.) $350,000. Client, First Baptist Church, Cocoa.

Pickett, Borowski and Stetson, Palm Beach and Pahokee, Fla.
Low rent housing project, Pahokee, Fla. (Civil, struc.) $1¼ million. Client, Pahokee Housing Authority.

GEORGIA

Albany Architects & Engineers, Albany.
Repair and renovation of administration building. $1,600,000. Client, Milledgeville State Hospital, Milledgeville.

Additional laundry structure. $150,000. Client, Milledgeville State Hospital, Milledgeville, Ga.

Ballinger-Meserole Co., Philadelphia.
Grocery warehouse. $190,000. Client, Associated Grocers Coop., Atlanta.

Dean Engineering Co., Albany, Ga.
Water works improvements, Lenox, Ga. (Civil) $48,000. Client, Town of Lenox, Ga.

Water works system, Georgetown, Ga. (Civil) $72,000. Client, Georgetown.

Water works and sewerage improvements, Unadilla, Ga. (Civil) $78,000. Client, City of Unadilla.

Water works planning and improvements, Camilla, Ga. $300,000. Client, City of Camilla.

ILLINOIS

Ballinger-Meserole Co., Philadelphia.

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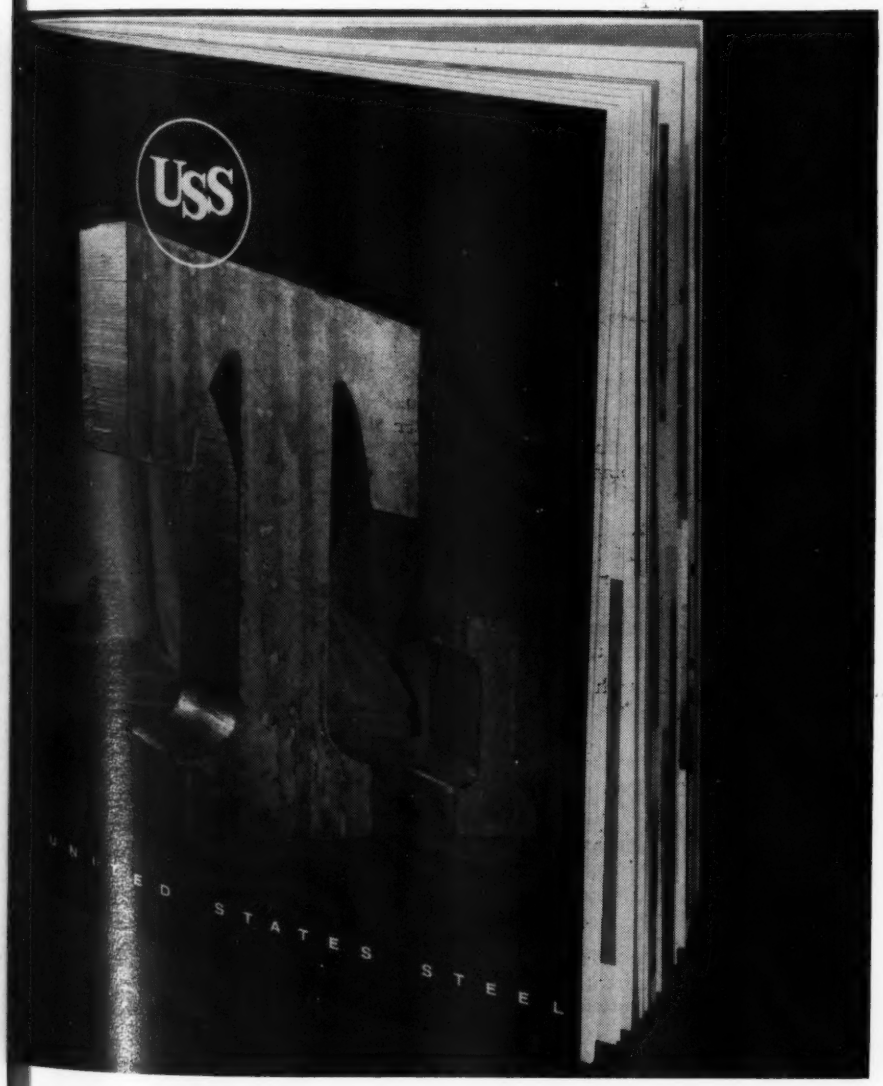

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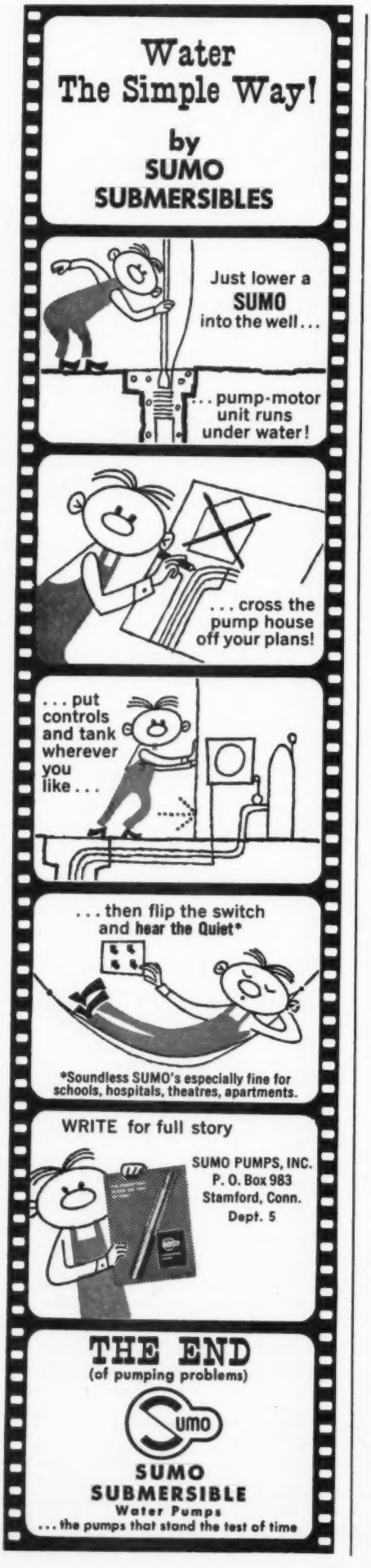

Grocery warehouse. $125,000. Client, Eagle-United, Inc., Moline, Ill.

Clifford Johnson & Assoc., Denver, Colorado.
Two-track bridge to carry Chicago Great Western Railway tracks over Des Plaines Ave. in Forest Park, Ill., in connection with Congress Street Expressway, Chicago, Ill. (Struc.) $240,000. Client, Chicago Great Western Railway Co.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Preliminary appraisal of economic potential and engineering feasibility of lake front development, Outer-Harbor —Illinois-Indiana.

A. Epstein & Sons, Inc., Chicago, Ill.
Add third story, 25,000 sq ft, to existing metallurgical laboratory and design of new building, 21,500 sq ft, for production of metallurgy products. $665,500. Client, Fansteel Metallurgical Corp., North Chicago, Ill.

Robert H. Anderson, St. Charles, Ill.
Water and sewer improvements, water mains, storage, sanitary sewer trunk lines, and relief lines. (Civil) $1,000,000. Client, City of St. Charles, Ill.

INDIANA

Jos. Rakowski, East Chicago, Ind.
Carrie Gosch Elementary School. $1,500,000. Client, school and City of East Chicago, Ind.

Hannan, Meek and Cordill, Indianapolis.
Remodel Court House building, Marion, Ind. Client, County Commissioners, Grant County, Marion, Ind.

Doctor's office building, 35 sq ft, parking lot and access drive. Masonry construction, concrete slab floor over masonry heating duct next to exterior walls, precast concrete unit roof. Client, Dr. D. D. Dickson, Greensburg, Ind.

Addition to Baptist Church building, Greensburg, Ind. Client, Trustees, Baptist Church.

IOWA

Ballinger-Meserole Co., Philadelphia.
Grocery warehouse. $50,000. Client, Lagomarcino-Grupe Co., Burlington, Ia.

KANSAS

Paden & Bartlett, Topeka, Kans.
Complete sewage treatment. (Civil) $130,000. Client, Tonjanoxie, Kans.

Complete sewage treatment. (Civil) $100,000. Client, Onaga, Kans.

North Hills Water Coop., wells and system water supply. (Civil) $200,000. Client, North Hills Water Co.

Meridan Water Coop., wells and system water supply. (Civil) $300,000. Client, Meridan Grantville Coop. Water Corp.

KENTUCKY

Davis Read, Chicago, Ill.
Coal property acquisition and development. Union County, Ky. (Mining) Coal mine installation, Union County, Ky. (Mining)

J. Stephen Watkins Consulting Engineers, Lexington, Ky.
Survey, design, and plans for approximately 11 miles of primary road, Frankfort to Versailles. (Civil, struc.) $2,500,000. Client, Ky. State Hwy. Dept.

Survey, design, and construction plans for approximately 8 miles of primary road southeast from Lexington. (Civil, struct.) $3,200,000. Client, Kentucky State Hwy. Dept.

Survey, design, and construction plans for approx. 11 miles of interstate highway north of Richmond. (Civil, struc.) $5,500,000. Client, Kentucky State Hwy. Dept.

LOUISIANA

Leo S. Weil & Walter B. Moses, New Orleans, La.
Refrigeration system with ultimate capacity of 4500 tons for Tulane University, New Orleans, La., together with underground chilled water and steam lines to all buildings on campus. (Mech., elec.) $3,000,000. Client, Tulane Univ.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Master plan for sewerage facilities for Baton Rouge, La. Client, Baton Rouge.

F. H. McGraw & Co., New York, N.Y.
Alumina plant and dock facilities, Burnside, La. (Civil, struc., mech.) $50,000,000. Client, Olin Mathieson Chemical Corp.

MARYLAND

Ballinger-Meserole Co., Philadelphia.
Warehouse. $36,000. Client, Wm. H. Cole & Son, Baltimore, Md.

Singstad & Baillie, New York, N.Y.
Design of ventilating system for Baltimore Harbor Tunnel. $1,000,000 (est.) Client, Maryland State Roads Comm.

J. E. Greiner Co., Baltimore, Md.
Baltimore Harbor Tunnel project, consisting of 1.4-mile-long tunnel and 16.3 miles of ramps and approaches. $130,000,000. Client, Maryland State Roads Commission.

Lutz & Scheibla, Washington, D. C.
Junior high school, complete facility. Silver Spring, Md. (Mech., elec.) $2,500,000. Client, Mont. County School Board, Johannes & Murray, Arch.

Lady of Good Council High School, Wheaton, Md. School, gymnasium, dormitory, chapel. (Mech., elec.) $1,500,000. Client, Zavarian Bros., Johnson & Boutin, Arch.

Elkton High School, Elkton, Md., complete facility. (Mech., elec.) $[illegible],500,000. Client, Cecil County School Board, Johannes & Murray, Arch.

Cumberland High School gymnasium

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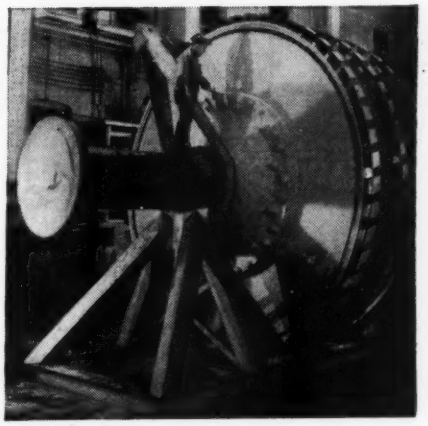

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addition, Cumberland, Md. (Mech., elec.) $1,500,000. Client, Allegheny County School Board, Johannes & Murray, Arch.

Ewell, Nelson & Bomhardt, Baltimore.
5.25 miles of road, Route 194 between Taneytown and Pennsylvania state line. (Civil, struc.) $600,000. Client, Maryland State Roads Commission.

Enlisted Men's Service Club and library, Fort Meade, Md. (Struc.) $400,000. Client, U.S. Corps of Engineers.

Edgewood Elementary School, Baltimore, Md. (Struc.) $1,200,000. Client, City of Baltimore.

MASSACHUSETTS

Richard Malkasian, Boston, Mass.
Brockton Shoppers Plaza, 130,000 sq ft, Brockton, Mass. $1,750,000. Client, Muradian Realty Trust.

Ammann and Whitney, New York, N.Y.
Headquarters office building, 97 x 37 ft, folded plate thin-shell concrete roof, cantilevered 19 ft front and rear from monolithic concrete corridor walls. Client, American Concrete Institute, Detroit, Mich.

MICHIGAN

Johnson & Anderson, Inc., Pontiac, Mich.
Sewage treatment plant. (Civil, struc., mech., elec.) $6,200,000. Client, City of Warren, Mich.

Sanitary sewers and storm drains. (Civil) $8,800,000. Client, City of Warren, Mich.

Sewage treatment plant. (Civil, struc., mech., elec.) $4,000,000. Client, Genesee County Sewage Disposal District.

Michigan Associates, Lansing, Mich.
US-112 highway and five bridges. $4,000,000. Client, Mich. State Hwy. Dept.

US-12 highway and ten bridges. $5,800,000. Client, Mich. State Hwy. Dept.

US-27 and four bridges. $800,000. Client, Michigan State Hwy. Dept.

MINNESOTA

Ballinger-Meserole Co., Philadelphia.
Warehouse. $130,000. Client, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Jack D. Salo, Inc., Duluth, Minn.
Municipal water system, Beaver Bay, Minn., including: water main distribution system; marine pipeline and raw water intake; building, detention tank, and electrical; elevated water reservoir; and water treatment plant and chlorinator. $139,126.93.

Lindsey, Carter & Associates, Inc., Excelsior, Minn., and **Robert E. Erickson Engineering Co.,** Minneapolis, Minn.
Joint project—new highway and bridges on Eustis Street, St. Paul, Minn. (Civil, struc.) $2,000,000 (est.) Client, Minnesota Dept. of Hwys.

Foley Brothers, Inc., St. Paul, Minn.
Anchor dam and access road. (Civil) $2,289,052. Client, U. S. Bureau of Reclamation.

MISSOURI

Ballinger-Meserole Co., Philadelphia.
Grocery warehouse. $150,000. Client, Tom-Boy, Inc., St. Louis, Mo.

Drazen and Assoc., St. Louis, Mo.
Two, one-story, central office buildings of approx. 400 sq ft each to house telephone dial equipment; one building in Auxvasse, Mo., one in Mokane, Mo. Revisions to existing central office building near Hatton, Mo. Client, Kingdom Telephone Co., Auxvasse, Mo.

Allgeier, Martin & Assoc., Joplin, Mo.
Sewerage system and oxidation pond. $165,000. Client, City of Licking, Mo.

Sewerage system and oxidation pond. $145,000. Client, Southwest City, Mo.

Water and sewerage system. $305,000. Pleasant Hill, Mo.

NEW JERSEY

Ballinger-Meserole Co., Philadelphia.
Grocery warehouse. $150,000. Client, Twin County Grocers, Inc., Linden.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Survey, analysis, and report of waterfront facilities. Client, California Oil Co., Perth Amboy, N.J.

Preliminary alignment studies, estimates, and contract plans and specifications for relocation of 15-mile long section of Route 22, Still Valley to Clinton Farms, N.J. $18,000,000 (est.). Client, New Jersey State Hwy. Dept.

Andre H. Vanderzanden, River Edge.
Reformed Church of Bergenfield, N.J. Church school addition to present plant. Structural engineering of three-story structural steel superstructure and reinforced concrete foundations. (Struc.) $170,000. Client, Gustave Pfost, Arch., River Edge, N.J.

NEW YORK

Edward Schnitzer, Rockville Centre, L.I., N.Y.
Apartment house development, 40 buildings, New York City. (Struc.) $16,000,000. Client, Alfred Levitt.

Senior high school, 1200 students, So. Huntington, N.Y. (Struc.) $2,400,000. Client, F. P. Wiedersum.

Senior high school, 1100 students, Malverne, N.Y. (Struc.) $2,099,000. Client, F. P. Wiedersum.

Kew Gardens Jewish Center, community center and house of worship, Queens, N.Y. (Struc.) $500,000 Client, A. W. Geller.

Temple Beth-El, community center and house of worship, No. Bellmore, N.Y. (Struc.) $300,000. Client, A. W. Geller.

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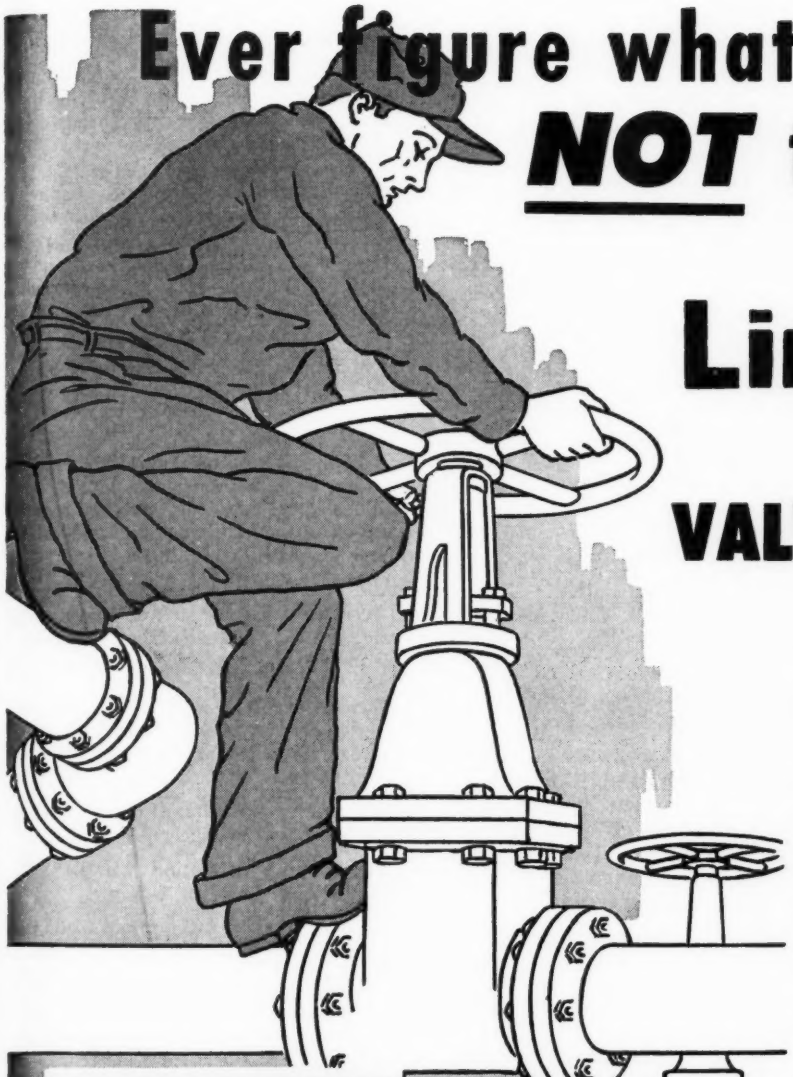

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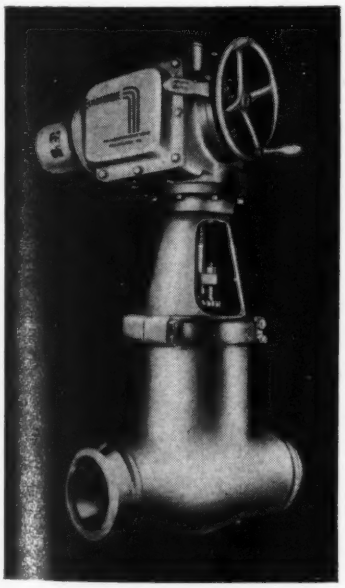

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Nursing home, Astoria, N.Y. (Struc.) $75,000. Client, Horn & Weinstock.

Stereo-room addition, printing plant addition, Garden City, N.Y. (Struc.) $35,000. Client, Albert Wood.

Gennaro Mianulli, Brooklyn, N.Y.
Office building, 4 stories, Brooklyn, N.Y. $450,000. Client, Tobias Goldstone.

Factory and warehouse, Queens, L.I. $250,000. Client, Michael W. Fradakis.

Preliminary studies for sugar storage, Brooklyn, N.Y. $1,000,000. Client, Anthony Nappi, Arch.

Bronx Corporation Hospital, Bronx, N.Y. $2,000,000. Client, Anthony De Pace, Arch.

St. Ann Roman Catholic School and auditorium, Brontwood, L.I. $600,000. Client, John O'Malley, Arch.

St. Joseph Roman Catholic School, Howlitt, L.I. $300,000. Client, Anthony De Pace, Arch.

St. Catharine Roman Catholic School, Brooklyn, N.Y. $600,000. Client, Joseph Mathieu, Arch.

St. Thomas The Apostle Roman Catholic School, Hempstead, L.I. $350,000. Client, Joseph Mathieu, Arch.

James N. De Serio, Buffalo, N.Y.
Elementary school, Portville, N.Y. $1,100,000. Client, Earl Martin, Arch.

Elementary school, Frewsburg, N.Y. $1,400,000. Client, Earl Martin, Arch.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Renovation of school heating systems for Public Schools No. 4, 19, and 23, Albany, N.Y.

Alignment studies for viaduct extension, interchanges, and service roads; preliminary and final designs for service roads; and preparation of right-of-way maps. Fuhrmann Boulevard Extension, Buffalo, N.Y.

Blitman & Tischler, New York, N.Y.
20-story apartment building, New York City. (Civil) $5,000,000. Client, Grass Bros., New York City.

20-story apartment building, New York City. (Civil) $6,000,000. Client, Grass Bros., New York City.

Brown and Matthews, Inc., New York.
Design manufacturing plant, 55,000 sq ft, garden-type construction, completely air conditioned. $1,000,000. Client, Servomechanisms, Inc., Westbury, Long Island, N. Y.

Charles N. & Selig Whinston, New York, N.Y.
Remodel 12-story office building, New York City. (Struc., mech., elec.) $500,000. Client, Mirtol Realty Corp.

Remodel 14-story apartment building, New York City. (Struc., mech., elec.) $1,500,000. Client, Henry Goelet.

New 8-story apartment building, New York City. (Struc., mech., elec.) $1,000,000. Client, Sedgwick Gardens Corp.

Gage & Martinson, New York, N.Y.
Design automatic parking garage, New York City. $1,000,000.

DeLeuw, Cather & Brill, New York, N.Y.
Kensington Expressway, Sections III and IVA, surveys and design for 2.7 miles of arterial highway within the City of Buffalo, N.Y. (Civil, struc.) $10,000,000. Client, New York State Dept. of Public Works.

Robert Floyd, Geneva, N.Y.
Bus garage, 2 stalls, repair and wash. Addison, N.Y. (Civil, struc., mech.). Client White & Helm, Arch., Geneva.

Addison Valley School. 7 classrooms plus offices and cafeteria with stage and kitchen. Client, White & Helm, Arch., Geneva, N. Y.

Addison Central School. 19 classrooms, playroom, cafeteria and auditorium combination, offices. Client, White & Helm, Arch., Geneva, N.Y.

Nussbaumer-Clarke & Velzy, Buffalo.
Town of Tonawanda, N.Y., pumping station, force main, and outfall sewer. (Civil) $1,500,000. Client, Tonawanda.

Incinerator addition. (Civil) $150,000. Client, Cheektowaga, N.Y.

Water pumping station. (Civil) $800,000. Client, Oswego, N.Y.

Sewage treatment plant addition. (Civil) $3,500,000. Client, Rochester.

Pump and chlorinating station. (Civil) $200,000. Client, Jamestown, N.Y.

Gruenwald Assoc., Long Island City.
Milk bottling depot and offices, Brooklyn, N.Y. (Struc., mech., elec.). $600,000. Client, Sunnydale Farms, Inc.

Milk processing plant, Pierrepont Manor, N.Y. (Struc., mech., elec.). $320,000. Client, Queens Farms Dairy, Inc.

Milk powder plant, Prattsburg, N.Y. (Struc., mech., elec.). $100,000. Client, Prattsburg Creamery, Inc.

Extension of milk processing plant, Long Island City, N.Y. (Struc., mech., elec.). $100,000. Client, Queensboro Farms Products, Inc.

NORTH DAKOTA

George J. Toman, Mandan, N.D.
Water and sewerage system. $120,000. Client, Village of Selfridge, N.D.

Paving, curb, and gutter. $80,000. Client, Glen Ullin, N.D.

Curb, gutter, and sidewalk. $30,000. Client, Mandan, N.D.

Water treatment plant expansions. $275,000. Client, Mandan, N.D.

Watermain extensions. $60,000. Client, Mandan, N.D.

K. B. MacKichan & Assoc., Grand Forks and Minot, N.D.
Sewerage system and waterworks at Willow City, N.D. Complete system,

LOW COST DIFFERENCE BETWEEN

SLIPPING FEAR

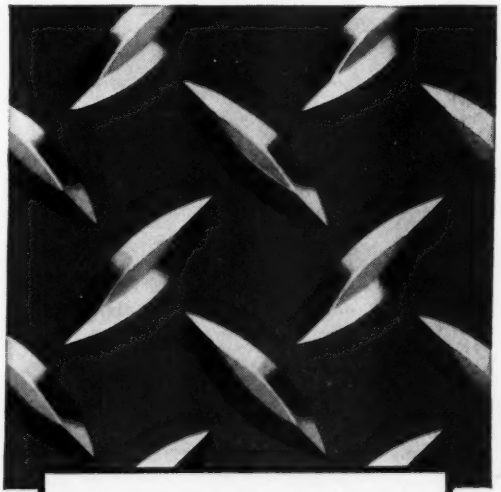
SAFETY

Pattern actual size

Eliminate slipping fear and increase efficiency by installing A.W. Super-Diamond—the low cost safety floor plate that takes the danger out of hazardous slipping areas.

Stops skids and slips *with*	Raised steel figures *diamond-shaped for maximum slip-skid resistance from all approach angles*
Get maximum wear *with*	Tough rolled steel floor plate
Easily fabricated *with*	Ordinary shop equipment
No matching problems *with*	Non-directional pattern—minimum waste
Cleans, drains rapidly *with*	No maintenance problems
Solve your slipping problem *with*	A.W. Super-Diamond as independent flooring, as an overlay—or used structurally.

For complete information write on company letterhead to Dept. SD-S11
No other floor plate can match A.W. Super-Diamond's safety and durability at so low a cost.



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the pump they couldn't clog!

It was a hydropulper application, handling 500 GPM of 5% stock at 50′ TDH. Among the things that sometimes entered the line were rubber gloves, baling wire, and even a tablecloth! A 6" Wemco torque flow Solids Pump passed them all and asked for more!

Write for more information on this amazing pump and its "can't-clog" *liquid impeller action.*

WEMCO
TORQUE-FLOW
SOLIDS PUMP

WESTERN MACHINERY COMPANY
650 FIFTH STREET, SAN FRANCISCO 7, CALIF.

stabilization lagoon, 50,000-gal overhead storage. $225,000. Client, City of Willow City.

Sewerage system at Petersburg, N.D. Complete system with stabilization lagoon. $70,000. Client, Petersburg.

Sewage disposal system at Parshall, N.D. Pumping station and stabilization lagoon. $30,000. Client, City of Parshall.

OHIO

Gustav Stueber, Pittsburgh, Pa.
Elementary junior-senior high school, Toronto, Ohio. (Civil, struc.) $750,000. Client, Joseph Hoover, Arch., Pittsburgh, Pa.

Arthur E. Rowe and Assoc., Cleveland.
Three-story, air-conditioned office building. 65,000 sq ft, concrete block and brick construction. $1,250,000. Client, Reliance Electric and Engineering Co., Cleveland, Ohio.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Engineering analyses of proposed sites, their suitability for port terminal development, preliminary layout of site, and estimates of costs. Client, Toledo-Lucas County Port Authority, Toledo.

William Schuller, Toledo, Ohio.
New building for Zion Lutheran Church, Toledo. $100,000. Client, Hahn & Hayes, Arch.

Locker building for Standard Oil Co., Toledo. $153,000. Client, Hoke & Nickerson, Arch.

St. Luke's English Lutheran Church addition, Toledo. $25,000. Client, Nelson Thal, Arch.

Ebasco Services, Inc., New York, N.Y.
Ten-story home office building. Client, Columbus and Southern Ohio Electric Co., Columbus, Ohio.

The Austin Co., Cleveland, Ohio.
Preliminary design for nuclear center near Cleveland. $7,000,000 (est.) Client, Case Institute of Technology, Cleveland, Ohio.

J. Stephen Watkins Consulting Engineers, Lexington, Ky.
Survey, design, and construction plans for improvement and widening of approx. 3 miles of primary road in Hamilton County. (Civil, struc.) $1,500,000. Client, Ohio State Hwy. Dept.

F. H. McGraw & Co., New York, N.Y.
Aluminum plant, Omal, Ohio. (Civil, struc., mech.) $100,000,000. Client, Olin Revere Metals Co.

Rolling mill and fabrication plant, Omal, Ohio. (Civil, struc., mech.) $46,000,000. Olin Mathieson Chemical Corp.

Sauter, Ritchie & Doane, Cuyahoga Falls, Ohio.
Sanitary outfall sewer and sewage treatment plant at Hudson, Ohio.

State Route #91 sanitary sewers, pumping station, and force main, General Motors Corp., Euclid Div., Hudson.

North main sanitary sewer system, Hudson, Ohio.

OKLAHOMA

Ballinger-Meserole Co., Philadelphia.
Grocery warehouse rehabilitation. Client, Scrivner-Stevens Co., Oklahoma City, Okla.

Warehouse. $45,000. Client, Standard-Humpty Dumpty, Oklahoma City, Okla.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Study of site plan and plant layout for new facilities, including new location of plant buildings, utilities, and shipping and receiving access facilities. Client, Robberson Steel Co., Oklahoma City, Okla.

OREGON

Cooper & Rose' Assoc., Portland, Ore.
Safeway distribution center, near Clackamas, Ore. Six structures to provide approx. 12½ acres under roof. Grocery warehouse, meat warehouse, frozen foods, perishable goods, administration building, and truck repair facilities. (Struc.) $5,300,000 (est.) Client, Williams & Martin, Arch.

Multnomah Athletic Club addition, Portland, Ore. 92,450 sq ft supporting floors and roof. Club rooms, swimming pool, and recreation. Fireproof, reinforced concrete, pile foundation. (Struc.) $1,450,000 (est.) Client, Church, Newberry & Roehr, Arch.

PENNSYLVANIA

Karp, Lesser & Co., Inc., New York.
Design and engineer plant layout for 26,000-sq-ft sheet metal fabricating plant. Client, Northeast Metals Industries, Inc., Philadelphia, Pa.

Buchart Engineering Corp., York, Pa.
Eight highway projects, District 8, including four structures. (Civil) $1,918,000. Client, Penn. Dept. of Hwys.

Six highway projects, District 6. (Civil) $1,785,000. Client, Penn. Dept. of Hwys.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Prepare preliminary designs and cost estimates for new facilities and improvements, Brodhead Creek Flood Control. Client, Philadelphia District, Corps of Engineers, U.S. Army.

Albert E. Peters Assoc., Scranton, Pa.
Boiler plant and laundry, Scranton, Pa. $100,000. Client, Moses Taylor Hosp.

Addition to sewage disposal system, Clarks Green, Pa. $25,000. Client, Borough of Clarks Green.

Gustav Stueber, Pittsburgh, Pa.
St. Anthony Roman Catholic Church. (Civil, struc.) $400,000. Client, Harold Clark, Arch., Monessen, Pa.

Huge fermenting tank moves through open wall area of Stroh stockhouse. Note strong, moisture-proof FOAMGLAS in place in some wall areas . . . where it stood exposed to the weather for weeks. Engineers: Harley, Ellington & Day, Inc., Detroit.

On the strength of FOAMGLAS . . . Stroh Brewery got 30 days extra production

Rapid sales growth at The Stroh Brewery Company, Detroit, has required building two new stockhouses since 1953. Each went into production 30 days sooner because it was insulated with extra-strong FOAMGLAS. Here's why:

Stroh stockhouses consist of a number of double-floor and single-floor units . . . each surrounded by an envelope of FOAMGLAS. While other construction was being completed, a wall was left open. Fermenting and aging tanks and other equipment were moved through it.

FOAMGLAS was then installed, free-standing, in the building frame . . . and was left fully exposed to the weather for weeks. Stroh was able to finish interior construction and start operations some 30 days sooner because FOAMGLAS doubled as insulation *and* wall until the exterior masonry was finished. This was possible because FOAMGLAS is rigid and 3 times stronger than the next strongest insulation. Weather cannot harm it because its all-glass, sealed cell structure is waterproof.

FOAMGLAS gave Stroh other benefits, too. Its sealed glass cell structure makes FOAMGLAS its own natural vapor barrier. And, being inorganic, it can't shrink, swell or warp guaranteeing Stroh vapor-tight joints. Moreover, it *stays dry* for constant, long-lasting insulating efficiency . . . is vermin-proof and incombustible. These benefits can be *yours, too.* Prove it with six simple tests you can perform in your own office. Write today for a free sample and testing directions. Address . . .

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Department R-67, One Gateway Center
Pittsburgh 22, Pennsylvania
In Canada: 57 Bloor St. W., Toronto. Ontario

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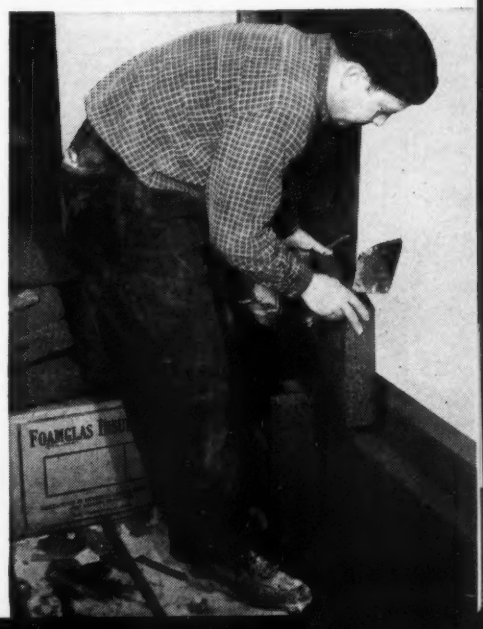
Workman is shown installing 6″ multilayer FOAMGLAS wall insulation within Stroh stockhouse framing. 8″ layer of insulation was applied on roof, 4″ on basement floor and 3″ on intermediate floors. Stroh also relies on moisture-proof FOAMGLAS for lasting insulating value in such other tough brewery uses as CO_2 storage areas, government cellar, low temperature piping, etc.



Basement and building, First Savings & Loan, Charleroy, Pa. (Civil, struc.) $300,000. Client, R. Tunssuy, Arch., Charleroy, Pa.

St. Andrea Roman Catholic School. (Struc.) $250,000. Client, LaNover, Retz & St. Jean, Arch., Beaver Falls, Pa.

St. Cecelia School, Rochester, Pa. (Struc.) $300,000. Client, LaNover, Retz & St. Jean, Arch., Beaver Falls, Pa.

South Fayette Junior-Senior High School. (Struc.) $800,000. Client, Joseph Hoover, Arch., Pittsburgh, Pa.

Ralph M. Parsons Co., Los Angeles.
High energy fuel plant, including administration building, warehouse, shop, and entrance building. $38,000,000. Client, Callery Chemical Co., Callery.

V. E. Shogren, Youngstown Ohio.
C. M. Musser Elementary School, Sharon, Pa. Structural and foundation design. $800,000. Client, Hunter, Heiges & Gross, Arch.

RHODE ISLAND

Richard Malkasian, Boston, Mass.
Warwick Shoppers Plaza. 110,000 sq ft, one-story shopping center, 24 units, masonry walls, steel roof slab on grade, with 10-ft canopy full length of store front. Parking for 1000 cars. Warwick, R.I. (Civil, struc., arch.) $1,500,000. Client, Muradian Realty Trust.

C. Richard Ortaleva, Providence.
Two one-story additions, Warwick, R.I. Cinder block walls, steel beams, joist roof, tar and gravel, hot water heat. (Civil, struc., elec.) $45,000. Client, Multi-Fabrics Corp.

Windmill Diner Corp., Providence, R.I. 150 x 40 ft (approx.). (Civil, struc., mech., elec.) $198,000. Client, Joseph D'Antuono.

SOUTH DAKOTA

Arthur S. Mannes, Aberdeen, S.D.
36,000 feet 24-in. water transmission line at Aberdeen. (Civil) $600,000. Client, City of Aberdeen, S.D.

Repair earth dam and new spillway, 25 miles northwest of Aberdeen. (Civil) $150,000. Client, City of Aberdeen, S.D.

McWayne & McLaughlin, Sioux Falls.
Sewage treatment plant. $750,000. Client, City of Worthington, Minn.

Raymond H. Reed & Co., Columbus, Nebraska.
One substation, 32 mi 34.5-kv transmission line, and 240 mi distribution line in Bennett and Washington Counties, S. D. (Elec.) $410,000. Client, LaCreek Electric Assoc., Inc., Martin.

TENNESSEE

Burns and Roe, Inc., New York, N.Y.
Engineer and supervise construction of electric generating station. Client, Memphis Light, Gas & Water Division, City of Memphis, Tenn.

TEXAS

B. Segall, Jr., Austin, Texas.
Printing plant. $1,000,000. Client, The Steck Co., Austin, Texas.

The Fluor Corp., Ltd., Los Angeles.
Design, engineer, and construct Houdry dehydrogenation process units, Channelview, Texas, and all off-site facilities including railroad spurs, roads, administration and lab buildings, shops, fire house, personnel building, tank car and tank truck loading facilities, and all utilities. $30,000,000. Client, Texas Butadiene & Chemical Corp.

H. E. Bovay, Jr., Consulting Engineers, Houston, Texas.
Feeder street paving, Houston, Texas. 2¼ miles of 44-ft wide concrete pavement and 300 linear ft of storm sewers for McKee, Hardy, and Elysian Streets; each street four 11-ft wide lanes. Part of over-all plan of improvement to provide access from Elysian Bridge to North Loop of Freeway system. $440,000 (est.) Client, Dept. of Public Works and Engineering, Houston, Texas.

Charles R. Haile Assoc., Inc., Houston.
Storm drains for proposed 2.2 mile expressway. (Civil) $500,000. Client, City of Texas City.

Val A. Lyons, Civil Engineer, Shreveport, La.
Dormitory, lounge, and dining facilities for 104 students at Kilgore College, Kilgore, Texas. (Struc.) $200,000. Client, W.E. Langford, Arch., Henderson.

David C. Pfeiffer and Joe Schwegmann, Dallas, Texas.
Expansion of Dallas plant of Lone Star Cement Corp. which will double present capacity. (Civil, struc., mech., elec.) $6,000,000. Client, Lone Star Cement.

Miles F. Wortham & Assoc., Houston.
Research laboratory building with offices, library, toilets, reception room. Flat slab concrete construction; utility tunnel, curtain walls, masonry, plaster partitions. Pilot plant building and drum oil storage, including office, balcony, switchgear room, drum oil storage building, hydrocarbon separation pit. (Civil, struc., mech., elec.) $300,000. Client, Eastern States Petroleum Co., Houston, Texas, and William Tamminga, Arch.

Office, warehouse, shop, and site facilities. 14,400 sq ft general office area; 3000 sq ft mechanical equipment, locker rooms, storage facilities; 24,000 sq ft general warehouse; 6000 sq ft shop building, yard paving, parking, drives; pipe racks; two railroad spurs. Prestressed concrete girders and deck, concrete and masonry walls, plaster and glass partitions. (Civil, struc., mech., elec.) $500,000. Client, Gulf Supply Co., Inc., Beaumont, Texas.

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Constant tests prove that ALL Sorgel dry-type transformers have low sound levels and high efficiency. These have been outstanding features in Sorgel transformers for many years; in fact, we are the pioneers in establishing low sound levels which we guarantee to be well below the established standards in ALL ratings up to 3000 Kva.

Completely modern testing facilities enable us to prove the sound level, efficiency, temperature rise, and performance of Sorgel transformers before installation.

Because of their low sound level, ALL Sorgel dry-type transformers are adaptable for any indoor installations — especially where low sound level is an important factor.

The liberal design of Sorgel dry-type transformers results in high efficiency at all loads, and they will carry an overload during an emergency at a safe operating temperature.

Sorgel sound-rated transformers are time-tested, and are specified by discriminating engineers and users everywhere.

Available in all standard and intermediate ratings — ¼ Kva to 3000 Kva, up to 15,000 volts.

Sorgel transformers are also incorporated in substations. Available with any type or make of switchgear, or from any substation manufacturer.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 843 West National Ave., Milwaukee 4, Wis.

40 years' experience in the development, manufacturing and application of transformers

VERMONT

Ballinger-Meserole Co., Philadelphia. Grocery warehouse. $70,000. Client, Cross-Abbott Co., White River Junction, Vt.

VIRGINIA

Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Contract plans and specifications for replacement of vertical-lift span of James River Bridge, Va.

Preliminary design studies for two semi-submerged shipways. Client, Newport News Shipbuilding & Dry Dock Co., Va.

Hayes, Seay, Mattern & Mattern, Roanoke, Va.
Sewerage system. (Civil) $200,000. Client, Stuart, Va.

Sewerage system. (Civil) $500,000. Client, Galax, Va.

Expansion of electrical distribution system, Norfolk, Va. (Elec.) $2,600,000. Client, U. S. Navy.

Water system. (Civil) $200,000. Client, Coeburn, Va.

Highway bridge. (Struc.) $600,000. Client, Commonwealth of Virginia.

Report on proposed Marine Terminal at Norfolk, Va. (Civil, struc., mech., elec.) $17,500,000. Client, Norfolk Port Authority.

Ballinger-Meserole Co., Philadelphia. Grocery warehouse. $213,000. Client, Richmond Food Stores, Inc., Richmond.

WASHINGTON

Ballinger-Meserole Co., Philadelphia. Warehouse rehabilitation. Client, Scott Paper Co., Everett, Wash.

R. W. Beck & Assoc., Seattle, Wash.
Expansion of sewage collection system to provide collection service to cities of Hunts Point, Medina, Clyde Hill, north section of Bellevue, and a section of King County. $2,000,000 (est.). Client, Bellevue Sewer District.

Enlargement of existing sewage treatment plant from .5 mgd to 2.0 mgd. $250,000 (est.). Client, Bellevue Sewer District.

WEST VIRGINIA

Charles Henry Sack Assoc., Charleston, W. Va.
West Virginia Pulp & Paper Co. Extension to present finishing and shipping departments. Plumbing, heating, humidity control, electric, process air. (Mech., elec.) $200,000. Client, Glenn C. Hancock, Arch., Charleston, W. Va.

James Sell, Charleston, W. Va.
Office building, Charleston. (Civil) $2,000,000. Client, C&P Telephone Co.

Sub-Station, Lincoln County. (Civil) $200,000. Client, C&P Telephone Co.

Law suits, Kan. County, Jackson County. (Civil) $1,000,000 (est.) Clients, Steptoe & Johnson; Jackson, Kelly, Holt and O'Farrell; Watts & Watts; Payne, Minor, Ray, Price & Loeb.

Mortgage loans. (Civil) $150,000 (est.) Client, various attorneys.

Recreation center. (Civil) $100,000 (est.) Client, Fraternal Order of Police.

WYOMING

Clifford Johnson & Assoc., Denver.
Three grade separation structures on F Street Freeway, Casper, Wyo. (Struc.) $285,000. Client, State Hwy. Dept.

K. J. Murray, Denver, Colo.
High school, Rawling, Wyo. (Mech.) $2,500,000. Client, Kellogg & Kellogg.

Highway department office building, Cheyenne, Wyo. (Mech.) $2,500,000. Client, Sam Hutchings, Arch.

FOREIGN

Gustav Stueber, Pittsburgh, Pa.
Glass plant, Korea. (Struc.) $3,500,000. Client, Frazier Simplex, Washington.

Ballinger-Meserole Co., Philadelphia. Grocery warehouse. $500,000. Client, Commonwealth of Puerto Rico Industrial Devl., San Juan, Puerto Rico.

Grocery warehouse. $45,000. Client, Ottawa Fruit Supply Ltd., Ottawa, Canada.

Grocery warehouse. $80,000. Client, Super Mercados, S.A., Mexico City.

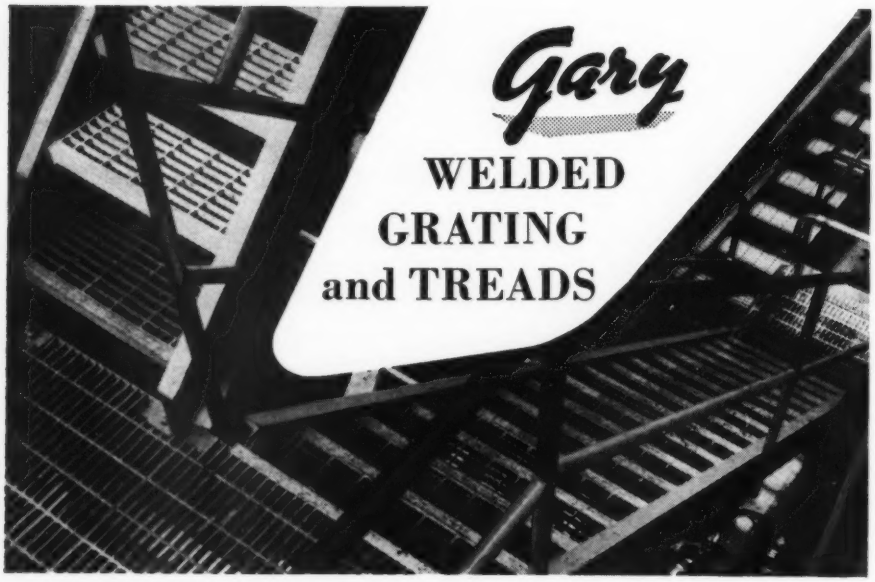
Parsons, Brinckerhoff, Hall & Macdonald, New York, N.Y.
Preliminary studies for central shop facilities to serve industrial plants at Moron, Venezuela. Client, Instituto Venezolano de Petroquimica.

Ewell, Nelson & Bomhardt, Baltimore.
U.S. Consulate building group, Nagoya, Japan. (Struc.) $420,000. Client, Dept. of State, U.S. Government.

Rader and Associates, Miami, Fla.
Master plan for Prospect Beach, 1100-acre tourist-residential development in Jamaica, B.W.I. Includes three or more major hotels, beach club, yacht basin marina, 18-hole golf course and country club, community hall, recreation areas, and parks, and at least 3000 homesites. $50,000,000 (est.) Client, group of prominent Jamaica citizens, including Audley Morais and Herbert Macdonald.

F. H. McGraw & Co., New York, N.Y.
Ammonia plant, urea fertilizer plant, Seoul. (Civil, struc., mech., elec.) $25,000,000. Client, Republic of Korea.

Asbestos of Quebec, Ltd. plant. (Civil, struc., mech.) $7,514,000. Client, Black Lake, Quebec.



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Write For Bulletin CE-67

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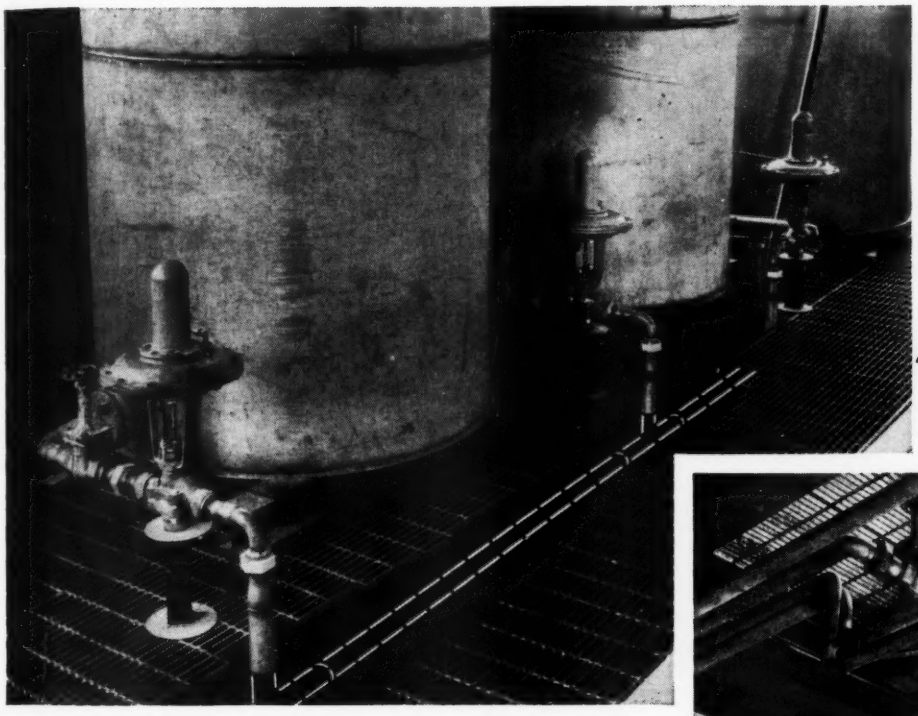

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Piping extending through and running beneath the floor grating can be loosened and removed for alteration or repair, if required. This is important in an inflammable area at American Alcolac Corporation's Baltimore plant, where pipe welding must be done *outside* the plant now that process operations are underway. It's one of the assembly advantages which American Alcolac Corporation in conjunction with Marcus Sittenfield & Associates, consulting engineers, recognized in SPEEDLINE unions . . . and one of the reasons they specified SPEEDLINE Fittings for the plant's complete process piping system.

SPEEDLINE FITTINGS CUT COSTS and simplified installation across the board. Because SPEEDLINE unions, ells, tees, aligning connectors and reducers are designed especially for use with light wall pipe. Economical Schedule 5 stainless pipe was used to minimize materials costs . . . yet maintain high degree of process purity. Labor time and costs were reduced, too, because SPEEDLINE Fittings' exclusive "Tangential Feature" — an extra straight section on *every* end of *every* formed fitting—permits free choice of joining method to effect easier, faster assembly . . . even in constricted areas.

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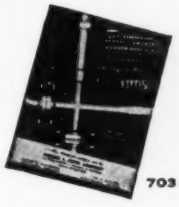

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Books

For

Consulting Engineers

COMPOSITION AND PROPERTIES OF CONCRETE, by George Earl Troxell and Harmer E. Davis; Mc Graw-Hill Book Co., Inc., 434 pp.; $7.75

Reviewed by
Carl L. Bankston, Jr.
G. A. Heft & Co.

This book presents complete and detailed information on its subject, plain concrete, ranging from a discussion of the basic materials from which concrete is made to a final chapter on the analysis and presentation of data derived from laboratory tests of concrete.

The three chapters of the book devoted to the constituent materials of concrete — portland cement, aggregates, water, and special-purpose admixtures — cover the manufacture, composition, and properties of the five principal types of cement; data on the gradations and mixes of fine and coarse aggregates and the chemical and physical properties of aggregates; and the properties of admixtures used to increase the workability or durability of concrete, or to change the rate of hardening or the heat evolution.

Other chapters offer material on the properties of freshly mixed concrete; on the batching, mixing, conveying, placing, and curing of concrete; on forms for concrete; and on the inspection of concrete construction.

The properties of concrete which affect its behavior in a completed structure, and thus are of primary interest to the structural engineer, are presented in other portions of the volume together with discussions of the variables influencing these properties. The subjects include permeability and durability, volume changes due to moisture changes and to creep induced by sustained loading, elastic and thermal properties, and extensibility and cracking.

Two chapters on proportioning mixes and on the strength of concrete were written by J. W. Kelly. The chapter on proportioning concrete mixes includes tables and graphs useful for developing proper concrete mixes, as well as an explanation of each commonly used method of mix proportioning. The chapter on strength of concrete contains a discussion of the various types of strength — compressive, tensile, shear, and bond strength — and the various factors that affect concrete's strength. The factors affecting the results of laboratory tests of concrete specimens are also treated in this chapter.

To increase the book's usefulness as a text for engineering courses on the subject of plain concrete, a section to be used as a laboratory manual is also included in the volume.

This book would be a useful addition to the bookshelf of any engineer engaged in design or construction employing concrete. Not only is the volume in itself an excellent reference source on its subject, providing information on all phases of modern concrete technology; but it also furnishes an extensive bibliography of more

Photo Left — Engine driven application City of Pensacola, Florida.

Photo Right—Combination Drive application, Clintonville, Wisconsin.

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Wide Application In Municipal & Industrial Coverage

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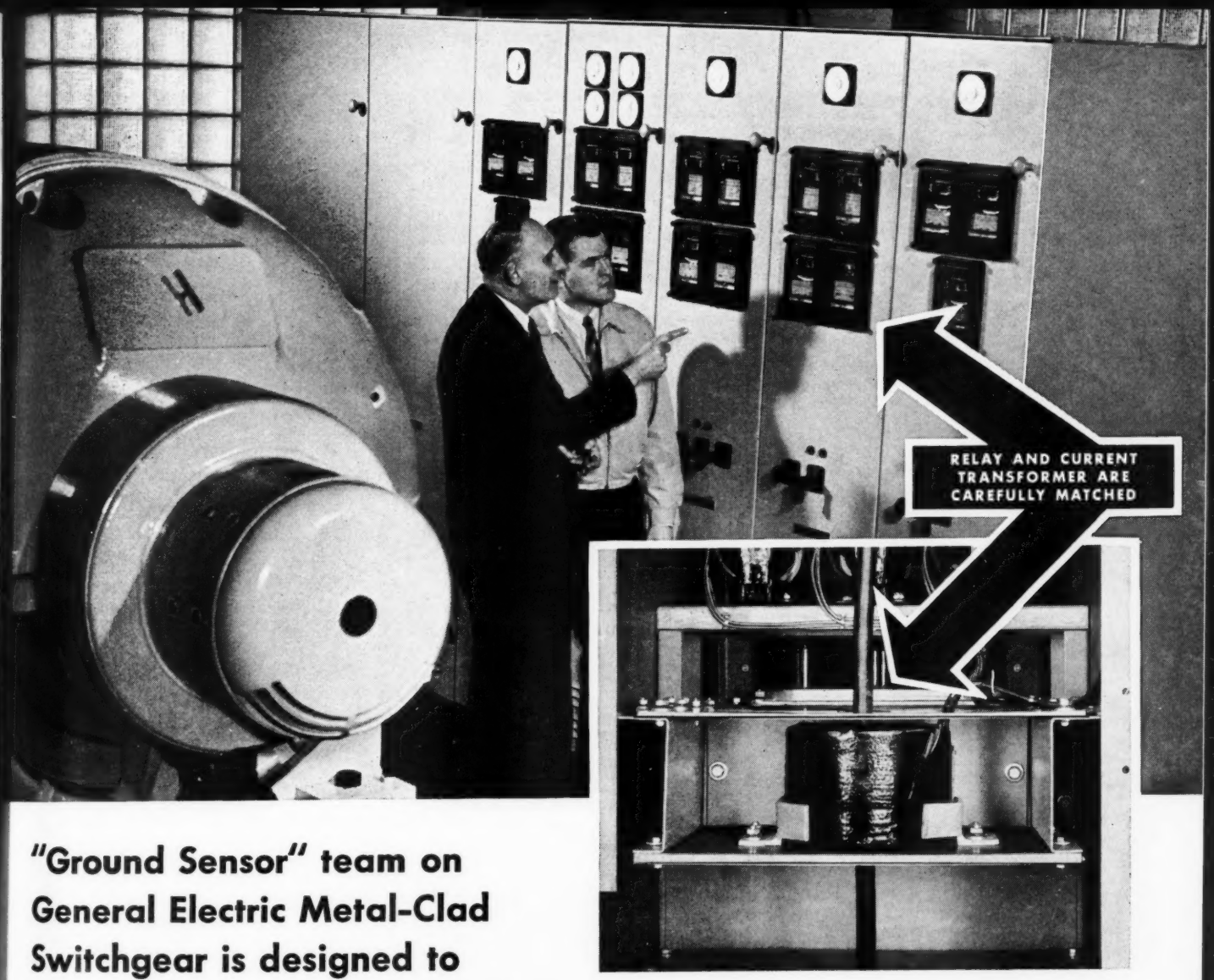


"Ground Sensor" team on General Electric Metal-Clad Switchgear is designed to

MINIMIZE MOTOR FAULT DAMAGE

Ground fault currents as low as 15 amperes will activate General Electric Metal-clad switchgear equipped with optional "Ground Sensor" equipment.

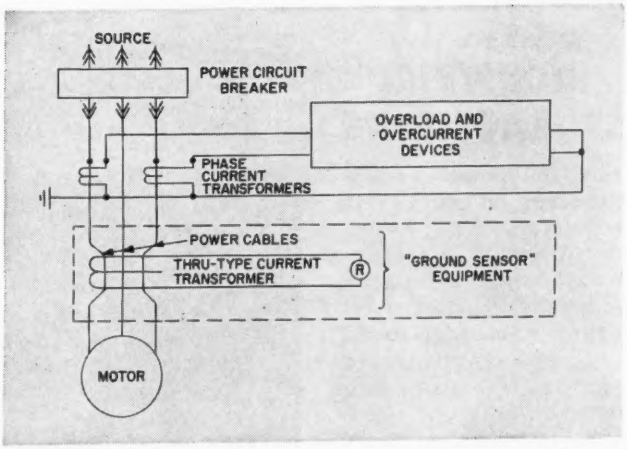
"Ground Sensor" teams a carefully matched current transformer and relay to offer this major advance in protective equipment for motors.

The unusual sensitivity of this equipment, combined with its instantaneous relaying acts to:

1. Practically "anticipate" trouble through early detection of ground faults and
2. Remove motors from the line *before* major fault damage can occur.

This more positive protection minimizes motor maintenance costs and limits expensive down time for motor repairs.

For full information on Metal-clad Switchgear with "Ground Sensor," see your G-E Sales Engineer or write Section 511-19, General Electric Company, Schenectady 5, N. Y.



A typical schematic diagram, showing location of "Ground Sensor" elements. Relay and current transformer team-up to detect ground faults and remove motors from service before major fault damage occurs.

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detailed works on special topics to point the way to solutions for the more abstruse problems that may arise infrequently.

•

DOCUMENTATION IN ACTION, by Jesse H. Shera, Allen Kent, and James W. Perry (based on the 1956 Conference on Documentation at Western Reserve University); Reinhold Publishing Corp., 471 pp.; $10.00.

Reviewed by
William H. Hyde, Librarian
Illinois Institute of Technology

The problems involved in handling the mountains of records used in research, engineering, business, government, industry, etc., are increasingly vital as consulting engineers and others constantly become more dependent upon the efficient use of graphic records. Here we have a detailed and up-to-date review of the organization and utilization of recorded information based upon the papers given by nineteen experts from various organizations and institutions during the 1956 Conference on Documentation at Western Reserve University. The many diverse aspects of documentation are brought together in an organized fashion by a co-operative effort involving experts in many fields, and the characteristics of recorded information are discussed at length.

Present requirements, methods, and problems in documentation (acquisition, classification, and indexing) are first reviewed from the writers' own information and experience as well as from the past literature. A glossary of documentation terminology is included. Methods of inter-organizational endeavors are stressed throughout, and there is a discussion of operations research in formulating decisions.

The heart of the book is the detailed and informative study of the methods and devices for the analysis, storage, and retrieval of information with a summary of the various systems used to organize this material. The future development and value of computers and similar machines is considered and their economic advantages discussed. Some of the problems involved in using digital computers for storing and searching information and in preparing bibliographies in operations research and library reference work are presented. Legal bibliography is given special consideration.

This book definitely is an aid to becoming aware of the new and improved information services and should be studied carefully by all those who are concerned with improving our present out-of-date methods of processing and using information.

ALSO AVAILABLE

A bibliography giving titles and publication references of articles published since 1950 on fabrication, assembly, welding, brazing, testing, designing, engineering, and other aspects of stainless steel honeycomb technology is available from the Engineering Research Dept., American Silver Co., 36-07 Prince St., Flushing 54, N. Y.

•

The "1957 Specifications for Metal Lathing and Furring" are available from the Metal Lath Manufacturers Association, Engineers Bldg., Cleveland 14, Ohio, free of charge. The 20-page booklet includes specifications for solid and hollow partitions; wall furring; metal lath attached directly to wood supports; contact, furred, and suspended ceilings; beam and column protection for fireproofing; and reinforcing for exterior stucco. Various spans and spacings for supporting metal lath and plaster ceilings are summarized in descriptive tables.

•

"Unconfined Compression Testing of Cohesive Soils," 58-page technical manual, is available from Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill., free of charge. This manual is the first of a new series

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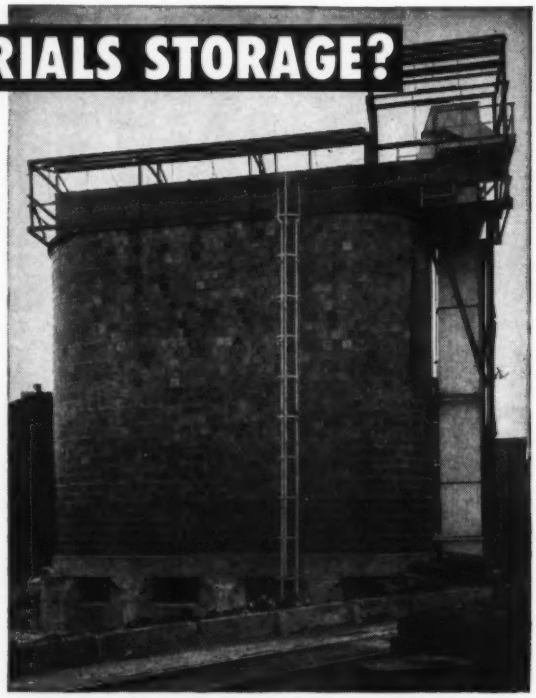

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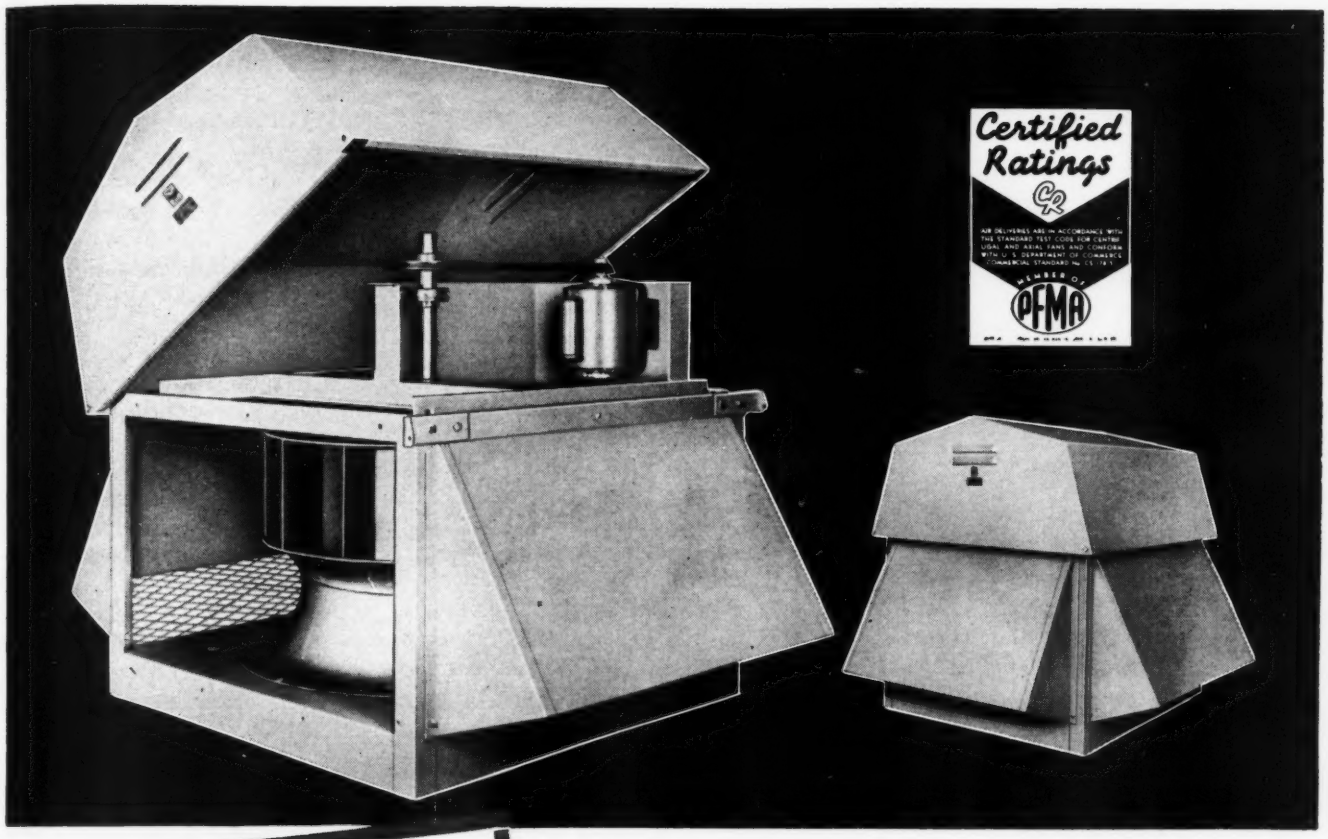

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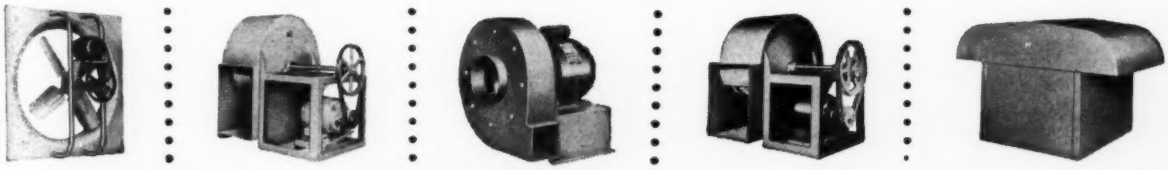

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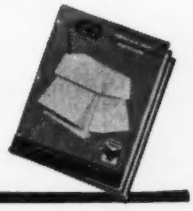

that will cover all major phases of testing construction materials.

•

"State of Connecticut Basic Building Code," effective as of Feb. 1, 1957, contains all pertinent state statutes and departmental regulations pertaining to buildings and structures. New sections include regulations of the State Fire Marshall, Department of Health, and the Division of Factory Inspection, Department of Labor. It is available from the State Public Works Department, State Office Bldg., Hartford 15, Conn.

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The American Concrete Institute has reprinted the report "Guide for Ultimate Strength Design of Reinforced Concrete," by Charles S. Whitney and Edward Cohen, which appeared in the November 1956 *ACI Journal*. It is intended to serve as a supplement to the "ACI Building Code." The report is available from the Institute, P. O. Box 4754, Redford Station, Detroit 19, Mich., for 75¢.

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The following publications are available from the Office of Technical Services, U. S. Department of Commerce, Wash. 25, D. C.

"Government Electronics Research, A Bibliography of Research Reports Released Through the OTS, January-December 1956," 50 pp., $1.50, No. PB 121779.

"Effect of Fatigue Stress History on Elasticity Properties and Stress Distribution Under Rotating Bending," by L. C. Lidstrom and B. J. Lazan, University of Minnesota, for Wright Air Development Center, 55 pp., $1.50, No. PB 121523.

"Fatigue Properties of Various Glass-Fiber-Reinforced Plastic Laminates," by K. H. Boller, Forest Products Lab., Forest Service, for Wright Air Development Center, 96 pp., $2.50, No. PB 121500.

"Techniques for Making and Projecting Stereoscopic Slides," by C. W. Kendal and W. H. Richards, Wright Air Devl. Center, 35 pp., $1.00, No. PB 121282.

"Development of Fire Retardant Paints and Paint Systems," by H. Miller and R. W. Hill, Army Engineer Research and Development Laboratories, 125 pp., $3.25, No. PB 111939.

"Weathering of Glass-Fabric-Base Plastic Laminates," by F. Werren and B. G. Heebink, Forest Products Lab., Dept. of Agriculture, for Wright Air Development Center, 56 pp., $1.50, No. PB 121390.

"The Resistance of Glass Reinforced Plastics to Temperature-Humidity Cycling," by F. R. Barnet, Naval Ordnance Lab., 11 pp., 50c, No. PB 121173.

"Evaluation of Polyester Film-Laminated Greaseproof Barrier Materials," by H. M. Weiner and M. E. Gigliotti, Picatinny Arsenal, U.S. Army, 12 pp., 50c, No. PB 121348.

FILMS

"Modern Methods for Joining Metals," Linde Air Products Co., sound and color, 16 mm, 20 min.

Filmed at leading metal fabricating companies and Linde's laboratories, this film illustrates the importance of the welding engineer in industry. It shows the many factors involved in electric welding, and how research, development, and engineering serve to provide increasingly better methods and equipment.

•

"Captive Kilowatts," Allis-Chalmers Mfg. Co., 16 mm, sound and color, 17 min.

The reversible pump turbine and its use to level system load curves is described. ▲▲

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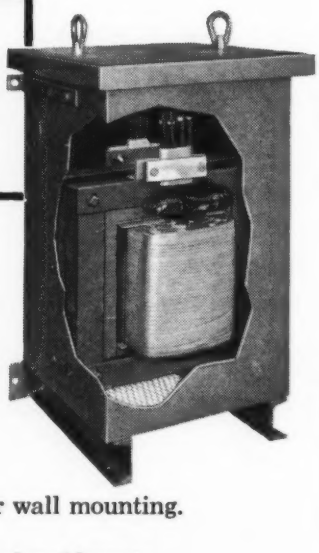

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